



Aerospace Medicine  
and Biology  
A Continuing  
Bibliography  
with Indexes

NASA SP-7011 (203)  
February 1980

National Aeronautics and  
Space Administration

# Aerospace Medicine & Biology

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## ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges.

STAR (N-10000 Series) N80-10001 - N80-11998

IAA (A-10000 Series) A80-10001 - A80-13128

# AEROSPACE MEDICINE AND BIOLOGY

## A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 203)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in January 1980 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA)*.



Scientific and Technical Information Branch      1980  
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This Supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, at the price \$7.00 domestic; \$14.00 foreign.

# INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 150 reports, articles and other documents announced during January 1980 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1980 Supplements.

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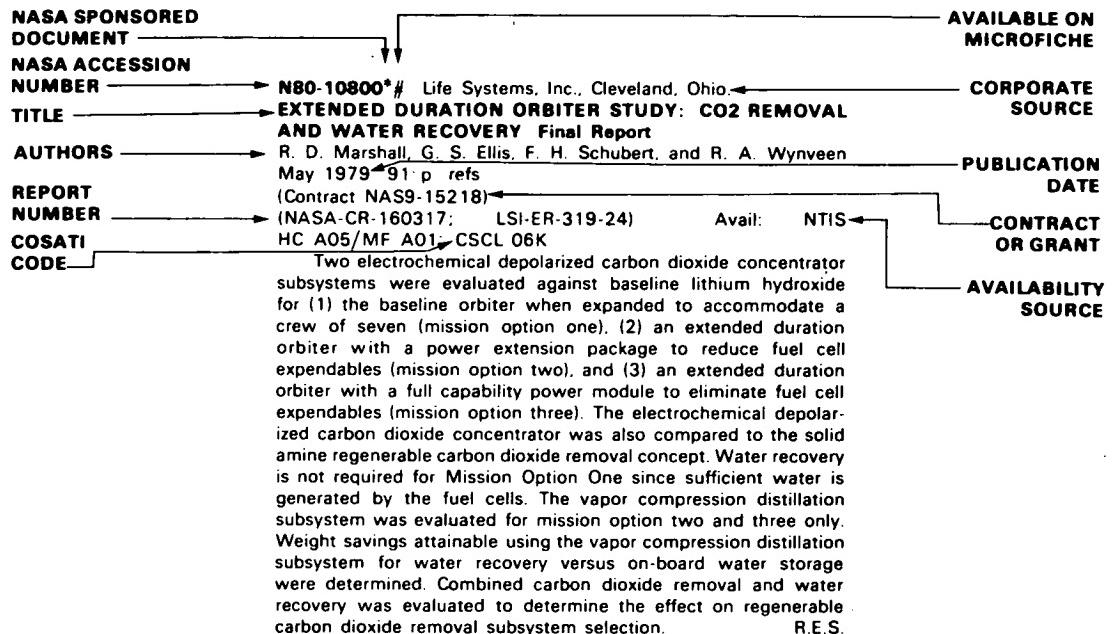
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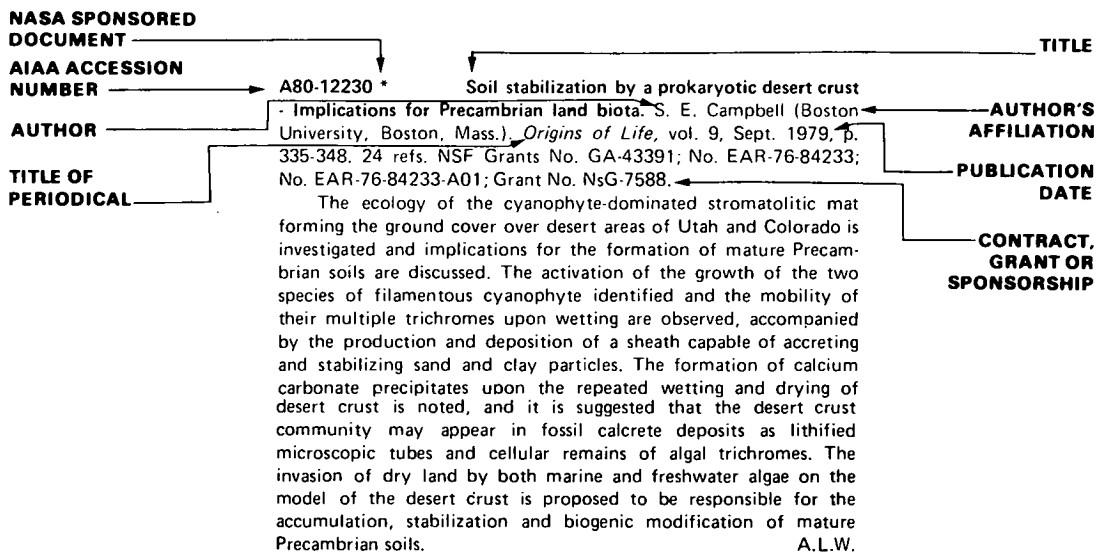
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## TYPICAL CITATION AND ABSTRACT FROM STAR



## TYPICAL CITATION AND ABSTRACT FROM IAA



# AEROSPACE MEDICINE AND BIOLOGY

*A Continuing Bibliography (Suppl. 203)*

FEBRUARY 1980

## IAA ENTRIES

**A80-10326** Regulation of the energy metabolism and physiological state of the organism (Reguliatsii energeticheskogo obmena i fiziologicheskoe sostoianie organizma). Edited by M. N. Kondrashova. Moscow, Izdatel'stvo Nauka, 1978. 239 p. In Russian.

A collection of papers is presented concerning the investigation of relationships between intracellular and hormonal regulations of the use of oxidation substrates. Attention is given to a discussion of the phenomenon and mechanisms of alternate use of carbohydrates and lipids, as well as the role of mitochondria in glycogenesis. The energetics of lymphocytes and substrate exchange between lymphoid tissue and other organs is described. The effectiveness of analyzing mitochondrial and mitochondrial-cytoplasmic transformations for evaluation of the physiological state of the body and the mechanism of pharmacological and toxic effects is demonstrated.

S.D.

**A80-10327** # Alternate use of carbohydrates and lipids as a form of regulating the physiological state (Peremennoe ispol'zovanie uglevodov i lipidov kak forma reguliatsii fiziologicheskogo sostoianija). M. N. Kondrashova and E. I. Maevskii. In: Regulation of the energy metabolism and the physiological state of the organism. Moscow, Izdatel'stvo Nauka, 1978, p. 5-14. 17 refs. In Russian.

Intracellular regulators of energy metabolism are effective in regulating the physiological state of the body (principle of equivalence of regulatory mechanisms). Periodical alternation of carbohydrates and lipids forms the basis of biological clocks (rhythms). At the time of switching from the use of one storage to the use of another, additional influences may drastically hinder the normal periodicity of metabolic events.

S.D.

**A80-10328** # Temporal organization of energy metabolism and the cellular clocks (Vremennaja organizatsija energeticheskogo metabolizma i kletochnye chasy). E. E. Sel'kov. In: Regulation of the energy metabolism and the physiological state of the organism. Moscow, Izdatel'stvo Nauka, 1978, p. 15-32. 15 refs. In Russian.

The paper presents a theoretical analysis of mechanisms responsible for the allosteric regulation of futile (potentially useless) cycles of energy metabolism. It is shown that the activation of phosphofructokinase production and the substrate depression of fructobisphosphatase by means of fructose-1,6-bisphosphate - absolutely necessary for the normal functioning of carbohydrate energy metabolism - cause periodical reciprocal changes in the metabolism of carbohydrates, lipids, and amino acids. A conclusion is drawn that these changes are the only possible form of prolonged functioning of the energy metabolism containing futile cycles.

S.D.

**A80-10329** # Oxidation of pyruvate in mitochondria: Mathematical model - Regulation of the Krebs's cycle by adenine and pyridine nucleotides (Oksilenie piruvata v mitokondriakh: Matematicheskaja model' - Reguliatsija tsikla Krebsa adeninovymi i piridinovymi nukleotidami). V. V. Dynnik and A. V. Temnov. In: Regulation

of the energy metabolism and the physiological state of the organism. Moscow, Izdatel'stvo Nauka, 1978, p. 33-50. 21 refs. In Russian.

**A80-10330** # Factors affecting the regulation of biological oxidation processes in tissue specimens (O faktorakh, vliiajuščikh na reguliatsiju protsessov biologicheskogo oksilenija v tkanevykh preparatakh). L. D. Luk'janova, O. A. Popova, V. E. Romanova, A. G. Ovchinnikova, A. T. Ugolev, and G. N. Kostjajeva. In: Regulation of the energy metabolism and the physiological state of the organism. Moscow, Izdatel'stvo Nauka, 1978, p. 90-101. 21 refs. In Russian.

The study demonstrates that the energy regulation of sections (brain, liver, heart) is recovered after a specific metabolic period associated with the extirpation of the tissues. Variation of metabolic sensitivity in a responsive tissue reflects the energetic state of mitochondria in tissue cell, as well as the tissue-specific characteristics of metabolic regulation in the cell. The temperature regime affects the state of the respiratory chain in the cell, the activity of its various sections, and the interaction with oxygen-dependent extra-mitochondrial processes.

S.D.

**A80-10331** # Role of mitochondria in glycogenesis (Rol' mitokondrii v glukoneogeneze). E. I. Maevskii and M. N. Kondrashova. In: Regulation of the energy metabolism and the physiological state of the organism. Moscow, Izdatel'stvo Nauka, 1978, p. 145-165. 103 refs. In Russian.

**A80-10332** # Phosphoenolpyruvate synthesis and reactions of the respiratory chain of mitochondria in the liver of animals during physiological adaptive responses (Sintez fosfoenolpiruvata i reakcii dykhatel'noi tsepi mitokondrii v pecheni zhivotnykh pri fiziologicheskikh adaptatsionnykh reaktsiakh). E. A. Kosenko, Iu. G. Kaminskii, M. N. Kondrashova, E. I. Maevskii, E. B. Okon, F. M. Taras'jants, E. S. Kotliarevskaia, and L. P. Barsukova. In: Regulation of the energy metabolism and the physiological state of the organism. Moscow, Izdatel'stvo Nauka, 1978, p. 166-170. In Russian.

**A80-10333** # Age-dependent dynamics of the succinate-dehydrogenase activity of lymphocytes in physically active and inactive persons (Vozrastnaja dinamika suksinatdegidrogenaznoi aktivnosti limfositov u fizicheski aktivnykh i neaktivnykh liudej). I. A. Komissarova, G. N. Lavrukhina, Iu. V. Gudkova, A. I. Zivenko, and R. E. Petrosian. In: Regulation of the energy metabolism and the physiological state of the organism. Moscow, Izdatel'stvo Nauka, 1978, p. 179-183. 14 refs. In Russian.

Blood lymphocytes are cytochemically analyzed for succinate-dehydrogenase (SDH) activity in children, adolescents and middle-aged individuals, as well as in physically well trained athletes and untrained persons. It is shown that during the growth and development period, the SDH activity is enhanced, whereas it diminishes in the aging process. Empirical data are used to develop a theoretical curve which shows the trend of changes in the SDH activity during human lifetime. Systematic physical exercises inhibit the involute changes in SDH activity. As for athletes, the effect of SDH changes on muscular work depends on the fitness level.

S.D.

**A80-10334** # Variation of the enzymatic activity of blood lymphocytes at various stages of adaptation to physical loads

(Izmenenie fermentativnoi aktivnosti limfositov krovi na raznykh etapakh adaptirovannosti k fizicheskim nagruzkam). A. S. Ianovskaya. In: Regulation of the energy metabolism and the physiological state of the organism. Moscow, Izdatel'stvo Nauka, 1978, p. 189-192. 7 refs. In Russian.

A80-10335 # Variation of substrate contents and activity of enzymes of the energy metabolism in the heart under the action of glutamate during hypoxia and sodium nitrite poisoning of animals (Izmenenie soderzhaniia substratov i aktivnosti fermentov energeticheskogo obmena v serdtse pod vliyaniem glutamata pri gipoksii i otrovlenii zhivotnykh nitritom natriia). L. G. Shmeleva. In: Regulation of the energy metabolism and the physiological state of the organism. Moscow, Izdatel'stvo Nauka, 1978, p. 215-217. In Russian.

A80-10344 Behavioral measures of aircrew mental workload. R. C. Williges and W. W. Wierwille (Virginia Polytechnic Institute and State University, Blacksburg, Va.). *Human Factors*, vol. 21, Oct. 1979, p. 549-574. 154 refs. AF Project 2050; NAVAIR Task 340F.

Behavioral research literature pertaining to the measurement of aircrew workload was classified into general categories of subjective opinion, spare mental capacity, and primary task metrics. Fourteen specific classes of workload measures related to these general categories were reviewed specifically in regard to aircrew workload assessment in the flight test and evaluation. Each class of measures was summarized in terms of background, applications, and implications for research and implementation. It was concluded that no one, single measure can be recommended as the definitive behavioral measure of mental workload. Due to the multidimensionality of workload, it appears that the most promising assessment procedure should include multiple measures of subjective opinions, spare mental capacity, and primary task measures as well as physiological correlates. (Author)

A80-10345 Physiological measures of aircrew mental workload. W. W. Wierwille (Virginia Polytechnic Institute and State University, Blacksburg, Va.). *Human Factors*, vol. 21, Oct. 1979, p. 575-593. 81 refs. AF Project 2050; NAVAIR Task 340F.

Physiological measures of aircrew mental workload were divided into fourteen specific classes. Each class was then summarized in terms of background, applications, and implications for research and implementation. It is concluded that several physiological measures appear promising, but that more research is needed to provide convincing evidence of viability. Physiological techniques can, however, be combined with other workload assessment techniques to provide a more complete understanding of the workload associated with given aircrew tasks. (Author)

A80-10421 Strength-interval curves of isolated rat papillary muscle during hypoxia and reoxygenation - Effect of lidocaine. B. Avitall (Tufts University, Medford; New England Medical Center Hospital, Boston, Mass.). *Journal of Electrocardiology*, vol. 12, Oct. 1979, p. 353-360. 23 refs.

A80-10422 The normal values of spatial velocity in the second part of QRS /A cooperative study of 229 healthy individuals/. A. J. Chorão de Aguiar, H. Guimarães, and A. Raposo (Coimbra, Universidade, Hospital, Coimbra, Portugal). *Journal of Electrocardiology*, vol. 12, Oct. 1979, p. 381-386. 21 refs.

The spatial velocity (SV) represents the inscription velocity from spatial vectors of the QRS loop. According to Sano (1967), this parameter has exhibited a diagnostic capacity for some well-defined pathologies. Using Hellerstein and Hamlin's formula (1960), the SV has been determined from the orthogonal Frank leads in a 250 mm/sec recording. Using Simonson's criteria (1961), 229 normal individuals, arranged in seven groups according to age and sex, were

used in an attempt to get normal values for the second half of the QRS loop. SV was determined in six time intervals of 2.5 msec from the 25 msec vector before the end of QRS. Significant differences were found between the values obtained from each time interval, except in the 35-37.5 msec and 37.5-40 msec vectors. On the other hand, no significant differences were found among the normal individual groups. (Author)

A80-10423 Torso mounted electrocardiographic electrodes for routine clinical electrocardiography. D. Diamond (Mt. Auburn Hospital, Cambridge, Mass.), D. H. Griffith (Memorial Hospital, Pawtucket, R.I.), M. L. Greenberg, and R. A. Carleton (Memorial Hospital, Pawtucket; Brown University, Providence, R.I.). *Journal of Electrocardiology*, vol. 12, Oct. 1979, p. 403-406. 10 refs.

A system of torso-mounted electrocardiographic leads similar to that proposed by Mason and Likar (1966) for stress electrocardiography is compared with the standard lead system in order to define any limitations to the more general application of the modified system. Placement of the right and left arm electrodes immediately below the outer third of the respective clavicles, the left leg electrode 4 cm below the umbilicus and the right leg electrode over the right side of the abdomen in the mid-clavicular line is found to lead to only small random differences in the ECGs recorded from those of the standard lead system, which are similar to those observed between successive standard tracings. The modified system is considered to be faster and simpler to apply than the standard system, as well as more suitable for certain clinical conditions and patients, without requiring a modification of diagnostic criteria.

A.L.W.

A80-10424 Relationship between calcium and hydrogen ions in heart muscle. A. R. Mattiazzi, H. E. Cingolani, and E. Spacapan de Castuma (La Plata, Universidad Nacional, La Plata, Argentina). *American Journal of Physiology*, vol. 237, Oct. 1979, p. H497-H503. 35 refs.

Experiments were performed on cat papillary muscles excised from the right ventricle of cats anesthetized with intraperitoneally administered sodium pentobarbital. The objective was to study the nature of the inverse effect of H(+) and Ca(2+) ions on cardiac performance. Evidence is presented that in cat papillary muscles this antagonistic action cannot be characterized as competitive. In particular, the experiments support the view that acid-base alterations are negative inotropic interventions in which a dissociation between maximal rate of force development and maximal velocity of relaxation occurs. The findings suggest that H(+) ion might have an effect on the relaxation process. S.D.

A80-10521 Cardiac reflexes in normotensive and spontaneously hypertensive rats. P. Thoren, E. Noresson, and S.-E. Ricksten (Goteborg, Universitet, Goteborg, Sweden). *American Journal of Cardiology*, vol. 44, Oct. 22, 1979, p. 884-888. 32 refs. Research supported by the Swedish Medical Research Council. SMRC Project 14X-04764; SMRC Project 14X-00016.

A80-10522 Control of blood pressure by carotid sinus baroreceptors in human beings. G. Mancia, A. Ferrari, L. Gregorini, G. Parati, M. C. Ferrari, G. Pomidossi, and A. Zanchetti (Milano, Università; CNR, Centro di Ricerche Cardiovascolari, Milan, Italy). *American Journal of Cardiology*, vol. 44, Oct. 22, 1979, p. 895-902. 38 refs.

A80-10525 Gamma rays - Further evidence for lack of a threshold dose for lethality to human cells. P. S. Furciniti and P. Todd (Pennsylvania State University, University Park, Pa.). *Science*, vol. 206, Oct. 26, 1979, p. 475-477. 10 refs. Grant No. NIH-R01-CA-17536.

In experiments designed to measure human cell survival with + or - 2% accuracy it was found that low doses (21 to 87 rad) of

gamma rays inactivated the colony-forming ability of cultured human cells with a probability of  $0.00226 + or - 0.00012$  per rad. There appears to be no threshold for the lethality of radiation to human cells in vitro.  
(Author)

**A80-10650** Work-science research on maximum work capacity and recovery time for informational-mental work based on the channel- and man-machine model along with superposed stress, using work in a hot environment as an example (Arbeitswissenschaftliche Untersuchungen von maximaler Arbeitsdauer und Erholungszeiten bei informatorisch-mentaler Arbeit nach dem Kanalund Regler-Mensch-Modell sowie superponierten Belastungen am Beispiel Hitzearbeit). H. Luczak. *VDI-Zeitschriften Fortschritt-Berichte, Reihe 10 - Angewandte Informatik*, no. 6, May 1979. 140 p. 207 refs. In German.

**A80-10738 \* #** The Viking mission and the search for life on Mars. H. P. Klein (NASA, Ames Research Center, Directorate of Life Sciences, Moffett Field, Calif.). (*International Union of Geodesy and Geophysics, General Assembly, 17th, Canberra, Australia, Dec. 2-15, 1979.*) *Reviews of Geophysics and Space Physics*, vol. 17, Oct. 1979, p. 1655-1662. 80 refs.

Experiments conducted by the Viking mission to search for life on Mars are examined and the results of direct chemical analyses are surveyed to determine the presence of any complex organic compound. Observations taken from lander imaging and experiments from biological investigation are analyzed for pyrolytic release, gas exchange (both humid and nutrient) and labeled release (LR). Attention is given to the results in an attempt to simulate LR initial reaction; and to the implications and extrapolations of the Viking mission.  
C.F.W.

**A80-10764** Flight hour reductions in fleet replacement pilot training through simulation. A. F. Smode (U.S. Navy, Training Analysis and Evaluation Group, Orlando, Fla.). In: *50 years of flight simulation; Proceedings of the Conference*, London, England, April 23-25, 1979, Session 1. London, Royal Aeronautical Society, 1979, p. 58-72. 14 refs.

The 2F87F simulator was found to be an effective substitute for the P-3 aircraft in the transition training of pilots. The general conclusion of the TAE study is that flight simulation efficiently utilized can be employed to advantage in military flight training. This is particularly so for pilot training in large multiengine, multipilot aircraft. New state-of-the-art flight simulators for these aircraft provide sufficient fidelity and capability to account for most training requirements. Safety is not compromised since transitioned pilots assume less than the aircraft commander role upon operational assignment.  
B.J.

**A80-10774** Simulator fidelity in the learning of complex flight tasks. E. A. Stark (Singer Co., Link Div., Binghamton, N.Y.). In: *50 years of flight simulation; Proceedings of the Conference*, London, England, April 23-25, 1979, Session 3. London, Royal Aeronautical Society, 1979, p. 17-29. 7 refs.

The fidelity of training devices has traditionally been approached either by attempting to reproduce all of the stimuli available to a system operator in the operational task environment, or by a less expensive method based on representing only the stimuli considered essential to a given task. Neither approach to the design and development of training devices has involved more than cursory consideration of the learning and perceptual processes associated with training. Task analyses directed at training equipment design have been devoted largely to defining the information available to the operator, but far less attention has been given to the ways in which this information is perceived by trainees at the various stages of training, or to the mechanisms by which specific patterns of information come to elicit specific responses, through learning. The necessity of considering the mechanics of learning in the development of training devices is emphasized.  
V.P.

**A80-10925** Numerical calculation of electromagnetic energy deposition for a realistic model of man. M. J. Hagmann, O. P. Gandhi, and C. H. Durney (Utah, University, Salt Lake City, Utah). *IEEE Transactions on Microwave Theory and Techniques*, vol. MTT-27, Sept. 1979, p. 804-809. 18 refs.

**A80-11328 #** Convective and radiative heat transfer coefficients for a clothed man. T. Mochida (Hokkaido University, Sapporo, Japan). *Hokkaido University, Faculty of Engineering, Bulletin*, June 1979, p. 1-9. 11 refs.

The paper considers convective and radiative heat transfer coefficients for a clothed man. The convection heat transfer coefficient is determined on the basis of the clothed man-equivalent thermal cylinder using Oosthuizen-Madan dimensionless equation for mixed heat transfer (1970). The radiative heat transfer coefficient expressed by the product of the emissivity of the human surface, the temperature factor, and the Stefan-Boltzmann constant was derived by linearizing the Gebhart absorption factor, and applying it to the space between a human body and its surroundings. The effect of clothing on the radiation heat transfer coefficient is discussed, and actual values computed.  
A.T.

**A80-11371** Microsecond sensitivity of the human visual system to irregular flicker. A. L. Diamond (Simon Fraser University, Burnaby, British Columbia, Canada). *Science*, vol. 206, Nov. 9, 1979, p. 708-710. 7 refs. National Research Council Grant No. A-9940.

Six experiments that were conducted to determine the brain responses to various alternating voltages of a flickering light are discussed. The stimulus response association was examined as well as the synchronous and asynchronous intervals of 32 to 512 flashes and the evoked potential alternations due to differing flash sequences. Results were found to suggest an underlying mechanism that may enhance visual detection of high frequency flicker.  
C.F.W.

**A80-11374** Resting heart rate in apparently healthy middle-aged men. J. Eriksson (Rikshospitalet, Oslo, Norway) and K. Rodahl (Norwegian College of Physical Education, Oslo, Norway). *European Journal of Applied Physiology*, vol. 42, no. 1, 1979, p. 61-69. 19 refs.

The resting heart rates of 2014 apparently healthy men between the ages of 40 and 59 were measured as part of a cardiovascular survey by means of a standardized auscultation technique. Values obtained were found to correlate well with ECG heart rate determinations of 200 subjects, and to be essentially the same in all clinically observed subgroups, including those with suspected coronary heart disease and pathological angiograms. Regression analysis indicated a drop in heart rate with age of 0.126 beats/year, accompanied by an increase in systolic blood pressure of 0.75 mm Hg/year. Blood pressure and heart rate were also found to correlate, possibly providing the link between heart rate and coronary heart disease. Discrepancies between the results of the present investigation and literature values were attributed in part to different experimental techniques.  
A.L.W.

**A80-11378** Modeling and parameter identification of the human respiratory system. D. M. Wiberg, J. W. Bellville, O. Brovko, R. Maine, and T. C. Tai (California, University, Los Angeles, Calif.). *IEEE Transactions on Automatic Control*, vol. AC-24, Oct. 1979, p. 716-720. 16 refs. Grant No. NIH-HL-15659.

The human respiratory response to breathing an excess of carbon dioxide gas is modeled on physiological grounds as an almost linear second-order system. The parameters corresponding to the gains, time constants, threshold, and noise powers are identified by both least squares and maximum likelihood methods. The purpose is both to find the site of action of drugs and to gain understanding of this part of the respiratory control system. It is concluded that the maximum likelihood method is necessary in cases where the noise is not white and when unbiased estimates of the gains and variances are essential, such as in drug studies and in some physiological modeling.  
(Author)

**A80-11520 # Animal experiment on the effects of repeated exposure to sustained Gz of moderate magnitude. I - Histopathological studies in rabbits.** C. Mizumoto, N. Nitami, K. Ohara, and R. Yurugi (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 19, Mar. 1979, p. 139-145. 15 refs. In Japanese, with abstract in English.

Normal rabbits were repeatedly exposed to sustained 3-Gz acceleration by centrifugation during 30 min/day for a minimum of three days and a maximum of 20 days. Body weight and heart rate were measured daily during centrifugation, showing changes followed by return to normal level. Several organs of sacrificed animals were examined for gross and microscopic pathologies. Microscopic examination on the 20th day of exposure to stressful acceleration revealed a mild to moderate congestion of the alveolar wall, capillary hyperemia, and plasma exudation to the alveolar cavity at the lower lung lobes; the adrenal cortex exhibited mild congestion and moderate hemorrhage. In contrast, third-day autopsy showed no histopathological changes.

S.D.

**A80-11521 # Effects of exposure to hypoxic environment upon operant behavior in rats.** I. Sakurai, E. Sakaguchi, T. Sakaguchi, H. Osada, K. Ohara, and R. Yurugi (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 19, Mar. 1979, p. 147-162. 13 refs. In Japanese, with abstract in English.

Rats were reinforced for food by two types of lever-press behavior of fixed ratio for 45 sec and low-rate differential reinforcement for 15 sec under normoxic and hypoxic environmental conditions with a view toward assessing changes in the functioning of the brain by examining the alteration of operant behavior in a hypoxic environment. The results suggest a close relation between decreased food intake and functional inhibition in the cerebral cortex during exposure to a hypoxic environment.

S.D.

**A80-11522 # Behavioral scientific study on T-2 flight simulator. II - Comparison of pilot workload between aircraft and simulator.** H. Hagiwara, S. Aramaki, and Y. Nagasawa (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 19, Mar. 1979, p. 163-174. 17 refs. In Japanese, with abstract in English.

Pilot workload of T-2 aircraft and T-2 flight simulator was measured in terms of subjective feeling, subjective scores of flight difficulties, flight score given by an instructor pilot, and heart rate. Most pilots estimated that the feeling of simulator motion was more or less similar to the aircraft motion. Simulator takeoff and landing were evaluated as more difficult than actual flight, most probably due to absence of visual cue in the simulator. Heart rate variations were greater during actual flight. High score is obtained in simulator instrument flight and actual inflight workload.

S.D.

**A80-11627 A modeling approach to the assessment of smooth pursuit eye movement.** E. J. Engelken and J. W. Wolfe (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *(Aerospace Medical Association, Annual Scientific Meeting, 50th, Washington, D.C., May 14-17, 1979.) Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1102-1107. 9 refs.

A quasilinear model of the oculomotor system in the performance of a smooth pursuit tracking task has been proposed. Model parameters (gain, phase, and spectral purity) have been measured for 21 normal subjects at stimulus frequencies of 0.2, 0.4, 0.8, 1.2, and 1.6 Hz. The normal oculomotor system was found to be quite linear when tracking at the three lowest frequencies, with up to 95% of the output power being linearly correlated with the input stimulus. Data from patients with known pathology are presented to demonstrate model parameter sensitivity to oculomotor dysfunction.

(Author)

**A80-11628 Effect of transdermally administered scopolamine in preventing motion sickness.** M. E. McCauley, J. W. Royal, J. E. Shaw, and L. G. Schmitt (Human Factors Research, Inc., Goleta;

ALZA Corp., Palo Alto, Calif.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1108-1111. 12 refs.

The efficacy of transdermally administered scopolamine was compared with the efficacy of oral dimenhydrinate and placebo therapy in the prevention of motion-induced nausea in a vertical oscillator. Medications were administered on a double-blind crossover basis, with the order of treatments counterbalanced. A placebo effect reduced the motion sickness incidence (MSI) from 100% to 59%. Administration of dimenhydrinate reduced the MSI to 32%, and use of the transdermal therapeutic system scopolamine (TTS-scopolamine) further reduced the MSI to 16%. TTS-scopolamine afforded 73% protection against motion-induced nausea, compared to 46% protection with dimenhydrinate. The TTS-scopolamine is designed to remain in the body for 72 hours, providing advantages over intramuscular or oral administration of scopolamine, which include reduced daily dosage, and an effective alternate to the gastrointestinal tract for administrating medication at times of gastrointestinal distress.

(Author)

**A80-11629 \* Self-motion magnitude estimation during linear oscillation - Changes with head orientation and following fatigue.** D. E. Parker, D. L. Wood, W. L. Gulleedge, and R. L. Goodrich (Miami University, Oxford, Ohio; Harvard University, Cambridge, Mass.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1112-1121. 27 refs. Research supported by Miami University; Contracts No. F615-75-C-5029; No. NAS9-14538.

Two types of experiments concerning the estimated magnitude of self-motion during exposure to linear oscillation on a parallel swing are described in this paper. Experiment I examined changes in magnitude estimation as a function of variation of the subject's head orientation, and Experiments II a, II b, and II c assessed changes in magnitude estimation performance following exposure to sustained, 'intense' linear oscillation (fatigue-inducing stimulation). The subjects' performance was summarized employing Stevens' power law  $R = k \times S^{\frac{1}{n}}$ , where  $R$  is perceived self-motion magnitude,  $k$  is a constant,  $S$  is amplitude of linear oscillation, and  $n$  is an exponent. The results of Experiment I indicated that the exponents,  $n$ , for the magnitude estimation functions varied with head orientation and were greatest when the head was oriented 135 deg off the vertical. In Experiments II a-c, the magnitude estimation function exponents were increased following fatigue. Both types of experiments suggest ways in which the vestibular system's contribution to a spatial orientation perceptual system may vary. This variability may be a contributing factor to the development of pilot/astronaut disorientation and may also be implicated in the occurrence of motion sickness.

(Author)

**A80-11630 \* Some influences of vision on susceptibility to motion sickness.** J. R. Lackner (U.S. Naval Aerospace Medical Center, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.) and A. Graybiel (Brandeis University, Waltham, Mass.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1122-1125. 21 refs. Contract No. NAS9-15147. NASA Order T-9140-E.

Two experiments were performed to evaluate the influence of vision on susceptibility to motion sickness during exposure to constant patterns of vestibular stimulation. The motion profile involved accelerating subjects at 20 deg/sec per sec to 300 deg/sec, maintaining them at that constant velocity for 30 sec, and decelerating them to a rapid stop in about 1.5 sec. The number of stops tolerated by a subject before reaching the motion sickness endpoint served as his score. In Experiment 1, subjects were tested twice with their eyes open and twice with their eyes blindfolded. They tolerated fewer sudden stops when permitted sight of the experimental chamber. In Experiment 2, the effect of having the eyes open or closed at different stages of the motion profile was evaluated. Having the eyes open during any stage of the test was more stressful than having the eyes closed, but this was especially true during the sudden stops. The findings are discussed in terms of their general implications for understanding (1) situations in which

vision alone elicits symptoms of motion sickness, and (2) situations involving vestibular stimulation where vision heightens susceptibility.  
(Author)

**A80-11631 \*** Oxygen levels safe for continued reproduction of *Drosophila* in normal and hypobaric atmospheres. G. P. Kloek (Kentucky State University, Frankfort, Ky.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1126-1128. 13 refs. Grant No. NSG-801.

**A80-11632** Regional cerebral blood flow in conscious miniature swine during high sustained +Gz acceleration stress. M. H. Laughlin, W. M. Witt, and R. N. Whittaker (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1129-1133. 19 refs.

**A80-11633** Responses of domestic fowl to repeated +Gz acceleration. A. H. Smith, W. L. Spangler, R. R. Burton, and E. A. Rhode (California, University, Davis, Calif.; USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1134-1138. 6 refs. Contract No. F41609-76-C-0012.

The responses of domestic fowl to repeated exposures of 4 min to +6Gz (8 times daily, 5 d weekly) are reported. Survivorship curves for the test group of 48 birds divided into three response categories: mode I, highly susceptible, with all individuals dying on the first day; mode II, more tolerant, with mortality occurring within the first 20 d of treatment; and mode III, highly tolerant, with mortality occurring only after 20 d of treatment. Observations of lymphocyte frequency, an index of systemic stress, and postmortem observations indicate that this heterogeneity has a biological basis. (Author)

**A80-11634** The 24-hour cycle and nocturnal depression of human cardiac output. J. C. Miller and M. Helander (Human Factors Research, Inc., Goleta, Calif.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1139-1144. 22 refs.

The NASA-developed version of the impedance plethysmographic method for the determination of left ventricular stroke volume was applied to the investigation of the daily variation of cardiovascular function. Hourly determinations of cardiac output and arterial pressure (auscultation) were obtained from two male subjects over the course of a 48-h period in the laboratory. Cardiac output displayed a strong 24-h cycle of nearly 1/min, peak-to-peak, cresting in the late evening hours. Nocturnal sleep was associated with a reduction of cardiac output characterized by a minimum in the early morning hours. It was concluded that a nocturnal, 24-h cyclic depression of waking cardiac output is exacerbated during sleep periods, and mechanisms for this exacerbation were suggested. (Author)

**A80-11635** Systolic time intervals and other cardiovascular changes following leg elevation. M. A. B. Frey and G. D. Krizsa (Wright State University, Dayton, Ohio). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1145-1149. 15 refs. Research supported by the American Heart Association; Grants No. NIH-IS-07155-01; No. NIH-R01-HL-19931-01.

Cardiovascular responses were noninvasively monitored as the legs of 16 supine human subjects were passively elevated to increase return of blood to the heart. Forearm vasodilation occurred promptly as previously observed by Roddie and Shepherd (1956). Arterial pressure and heart rate were unchanged. Ventricular performance, monitored by systolic-time-interval analysis, was enhanced after a delay of approximately 6 s, an effect which lasted throughout the 40-s leg-elevation period. All affected variables returned to control levels after the legs were lowered. This delayed response could result reflexly from stimulation of receptors in the left atrial region causing an increase in sympathetically mediated contractility or directly from the Frank-Starling mechanism in response to increased left ventricular filling. (Author)

**A80-11636** Noise dosimeter measurements in the Air Force. T. M. Fairman and D. L. Johnson (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1150-1157. 5 refs. Research sponsored by the U.S. Environmental Protection Agency and U.S. Air Force.

The paper presents the results obtained from the use of personal noise dosimeter monitoring devices, operating on the Air Force rule of 4 dB per doubling time and 84 dB(A) criterion level, to determine the occupational noise exposures of Air Force personnel working in hazardously noisy jobs. It is reported that the 8-h occupational noise levels ranged from 66-111 dB(A) with the median level at 84.5 dB(A). In addition, it is reported that noise dosimeters have been used at Air Force bases across the country in an experimental effort to determine how well their use would fit in with existing Air Force hearing conservation programs. Finally, some of the merits of noise dosimeters, as well as some of the problems involved in setting up ongoing noise monitoring programs, are discussed. M.E.P.

**A80-11637** Effects of pseudoephedrine and triprolidine on visual performance. S. M. Luria, H. M. Paulson, A. P. Ryan, and C. L. Schlichting (U.S. Naval Material Command, Naval Submarine Medical Research Laboratory, Groton, Conn.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1158-1160. 20 refs.

The effects of q.i.d. administration of 60 mg pseudoephedrine (Sudafed) tablets or pseudoephedrine-triprolidine (Actifed) tablets after 5 d of medication were measured on tests of night vision, color perception, stereopsis, and reaction time. Neither drug appeared to impair performance. (Author)

**A80-11638** Survey on eye comfort in aircraft. II - Use of ophthalmic solutions. W. G. Eng (Eye Clinic, Alameda, Calif.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1166-1169. 15 refs. Research supported by Bausch and Lomb, Inc. and Association of Flight Attendants.

Flight attendants frequently use ophthalmic solutions (eye-drops) to relieve their eye discomfort while working in the aircraft. The purpose of this paper is to present some insight concerning the use of ophthalmic solutions by flight attendants. A questionnaire was developed in conjunction with the Air Safety Department of the Association of Flight Attendants. The common eye problem characterized by conjunctival redness and eye irritation occurred with 95% of the 774 respondents. Furthermore, 60% of these respondents indicated that they have used eyedrops while in flight. The majority of the respondents were using an ocular decongestant; however, it is suggested that the use of artificial tears would be more effective in relieving eye discomfort in the aircraft. (Author)

**A80-11639** Sickle cell trait and the aviator. R. B. Rayman (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1170-1172. 8 refs.

The paper discusses the possibility that space travel enhances the sickle cell trait (SCT) found in humans. Attention is given to the risk of SCT in air travel and it is found that the danger becomes more perceptible when cabin altitudes exceed 21,000 ft. The possibility of SCT risk for USAF personnel is examined as well as the potential threat of cabin or cockpit decompression. It is determined that SCT occurs in a significant percentage of blacks and in individuals of Mediterranean descent. Although there is no apparent danger, since most people travel at altitudes below 21,000 ft, it is suggested that the problems that could result in the USAF be assessed of the risks involved. C.F.W.

**A80-11640** Student pilots referred to the neuropsychiatry branch, USAFSAM 1968-78 - Implications for selection. R. A. Levy, D. B. Tolson, and E. H. Carlson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1173-1175.

The case records of 76 student aviators referred to the Neuropsychiatry Branch of the USAF School of Aerospace Medicine during the period 1968-78 are reviewed. Demographic and diagnostic data are provided including source of recruitment, age, marital status, aircraft flown, flying hours, and diagnostic categories. Psychophysiological categories are particularly scrutinized and cameo case histories provided. Implications for pilot selection are discussed.

(Author)

**A80-11641** Lower body negative pressure box for +Gz simulation in the upright seated position. M. T. Lategola and C. C. Trent (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine*, vol. 50, Nov. 1979, p. 1182-1184. 6 refs.

A description and the operational characteristics of the lower body negative pressure (LBNP) box for plus Gz simulation in the upright seated position are presented. In this version, a negative pressure of minus 40 torr is considered the equivalent of a 2(+Gz) stress, and the box has withstood a minus 120 torr test pressure. The LBNP box, the hatch cover, and its adjustable waist-surrounding iris system are described, noting that the pedal ergometry within the box is easily accomplished. The box was engineered to accommodate human height from 160 to 195 cm, and locating it within an altitude chamber allows application of LBNP at any level of chamber altitude.

A.T.

**A80-11876 #** Cortical mechanisms of integrative brain activity (Kortikal'nye mekhanizmy integrativnoi deiatel'nosti mozga). A. S. Batuev. Leningrad, Izdatel'stvo Nauka, 1978. 53 p. 139 refs. In Russian.

The convergence and integration of somatic, visceral and external signals in elements of the cerebral cortex is examined in the case of the sensorimotor cortex. The internal organization of the various structural and functional neuronal modules in the sensorimotor cortex is discussed. Intersensory integration and the formation of cortifugal impulses are considered, with attention given to the principle of the dominant state of the central nervous system, mechanisms of sensory adaptation and sensitization, conditioned reflexes and the fixation of new behavior patterns.

A.L.W.

**A80-12223** Was the pre-biotic atmosphere of the earth heavily reducing. M. H. Hart (Trinity University, San Antonio, Tex.). *Origins of Life*, vol. 9, Sept. 1979, p. 261-266. 24 refs.

The oxidation state of the prebiotic earth atmosphere is estimated on the basis of oxygen production rates. It is shown that the approximately  $32 \times 10$  to the 21st g of oxygen corresponding to the approximately  $12 \times 10$  to the 21st g of carbon in sediments produced by green-plant photosynthesis can be accounted for mainly by the escape of  $1.2 \times 10$  to the 21st g as free atmospheric oxygen, the incorporation of  $8.0 \times 10$  to the 21st g in sedimentary rocks, and the oxidation of gases present in the prebiotic atmosphere and subsequently released volcanic gases by  $23 \times 10$  to the 21st g of oxygen. Such a heavily reducing prebiotic atmosphere is shown to be compatible with juvenile volcanic emissions, and it is noted that only if the carbon sediment abundance has been greatly overestimated can the primordial earth atmosphere have been nonreducing.

A.L.W.

**A80-12227** Antiquity and evolutionary status of bacterial sulfate reduction - Sulfur isotope evidence. M. Schidlowski (Max-Planck-Institut für Chemie, Mainz, West Germany). (College Park Colloquium on Chemical Evolution: Limits of Life, 4th, University of Maryland, College Park, Md., Oct. 18-20, 1978.) *Origins of Life*, vol. 9, Sept. 1979, p. 299-311. 48 refs. Research supported by the Deutsche Forschungsgemeinschaft.

The Precambrian sedimentary sulfur isotope record is surveyed in order to narrow in time the possible rise of sulfate-respiring organisms during the Early Precambrian. The sulfur isotope abundances of the Archean age are taken as a baseline, exhibiting delta

S-34 values close to zero per mil. Isotopic evidence of dissimilatory sulfate reduction is first observed in the upper Archean of the Aldan Shield, Siberia of 3.0 billion years ago and in the Michipicoten and Woman River banded iron formations of Canada of 2.75 billion years ago, narrowing the possible time of appearance of sulfate respirers to the interval 2.8 to 3.1 billion years ago. Sedimentary sulfur isotope data suggest that sulfate respiration followed sulfur photosynthesis, both of which significantly antedated oxygen respiration. Archean sulfate evaporites are thus attributed to the activity of photosynthetic sulfur bacteria, and not to the effects of oxidation weathering.

A.L.W.

**A80-12228** Archean photoautotrophy - Some alternatives and limits. A. H. Knoll (Oberlin College, Oberlin, Ohio). (College Park Colloquium on Chemical Evolution: Limits of Life, 4th, University of Maryland, College Park, Md., Oct. 18-20, 1978.) *Origins of Life*, vol. 9, Sept. 1979, p. 313-327. 85 refs. Research supported by Oberlin College.

Alternative hypotheses as to the nature of the photoautotrophs of the Archean era are discussed. Limits on the composition of the Early Proterozoic atmosphere provided by the change in composition of the continental sedimentary rocks are considered, and it is concluded that the Archean atmosphere contained small concentrations of oxygen, which rose significantly during the Early Proterozoic. Explanations of the rise of atmospheric oxygen include the hypotheses that (1) the transition reflects the appearance of the first blue-green algae; (2) primitive cyanobacteria flourished prior to the transition but backed the biochemical mechanisms to deal with the O<sub>2</sub> produced; and (3) cyanobacterial Archean O<sub>2</sub> production was consumed by volcanic emissions. An additional hypothesis that physiologically modern cyanobacteria of the Archean had low oxygen productivity, which rose sharply in the Early Proterozoic era to oxygenate the atmosphere, due to the replacement of Archean environments characterized by high rates of clastic and pyroclastic influx by widespread, stable, shallow marine platforms where productivity is high, is proposed.

A.L.W.

**A80-12229 \*** Oxygen as a factor in eukaryote evolution - Some effects of low levels of oxygen on *Saccharomyces cerevisiae*. L. Jahnke and H. P. Klein (NASA, Ames Research Center, Exobiology Research Div., Moffett Field, Calif.). *Origins of Life*, vol. 9, Sept. 1979, p. 329-334. 23 refs.

A comparative study of the effects of varying levels of oxygen on some of the metabolic functions of the primitive eukaryote, *Saccharomyces cerevisiae*, has shown that these cells are responsive to very low levels of oxygen: the level of palmitoyl-Co A desaturase was greatly enhanced by only 0.03 vol % oxygen. Similarly, an acetyl-CoA synthetase associated predominantly with anaerobic growth was stimulated by as little as 0.1% oxygen, while an isoenzyme correlated with aerobic growth was maximally active at much higher oxygen levels (greater than 1%). Closely following this latter pattern were three mitochondrial enzymes that attained maximal activity only under atmospheric levels of oxygen. (Author)

**A80-12230 \*** Soil stabilization by a prokaryotic desert crust - Implications for Precambrian land biota. S. E. Campbell (Boston University, Boston, Mass.). *Origins of Life*, vol. 9, Sept. 1979, p. 335-348. 24 refs. NSF Grants No. GA-43391; No. EAR-76-84233; No. EAR-76-84233-A01; Grant No. NSG-7588.

The ecology of the cyanophyte-dominated stromatolitic mat forming the ground cover over desert areas of Utah and Colorado is investigated and implications for the formation of mature Precambrian soils are discussed. The activation of the growth of the two species of filamentous cyanophyte identified and the mobility of their multiple trichomes upon wetting are observed, accompanied by the production and deposition of a sheath capable of accreting and stabilizing sand and clay particles. The formation of calcium carbonate precipitates upon the repeated wetting and drying of desert crust is noted, and it is suggested that the desert crust community may appear in fossil calcrete deposits as lithified microscopic tubes and cellular remains of algal trichomes. The

invasion of dry land by both marine and freshwater algae on the model of the desert crust is proposed to be responsible for the accumulation, stabilization and biogenic modification of mature Precambrian soils.

A.L.W.

**A80-12270** Biochemical chromophores and the interstellar extinction at ultraviolet wavelengths. F. Hoyle and C. Wickramasinghe (University College, Cardiff, Wales). *Astrophysics and Space Science*, vol. 65, no. 1, Sept. 1979, p. 241-244. 5 refs.

An attempt is made to identify the UV interstellar absorption feature at 2200 Å with molecules in biological systems. A smoothed mean interstellar extinction curve is compared with a histogram and a computed average absorption curve for naturally occurring biological chromophores in 186 molecules. The existence of a broad peak in the histogram spanning the wavelength range from 2150 to 2400 Å with a maximum close to 2200 Å is taken as providing a prima facie case for identifying the 2200-Å interstellar feature with molecules in biological systems. It is suggested that chromophores in biomolecules dominate the interstellar absorption at wavelengths of 1900 to 2800 Å, that less pronounced interstellar features at reciprocal wavelengths of 5.8 and 6.5 per micron are most likely due to biological chromophores involving single-bond electrons in saturated hydrocarbons, and that the interstellar extinction curve in the range from 0 to 9 per micron is readily explained on the basis of scattering by bacteria and viruses in interstellar space, together with chromophoric absorption.

F.G.M.

**A80-13018 \*** The radioracemization of isovaline - Cosmochemical implications. W. A. Bonner, N. E. Blair, R. M. Lemmon, J. J. Flores, and G. E. Pollock (NASA, Ames Research Center, Moffett Field; Stanford University, Stanford; California, University, Lawrence Berkeley Laboratory, Berkeley, Calif.). *Geochimica et Cosmochimica Acta*, vol. 43, Nov. 1979, p. 1841-1846. 30 refs. Research supported by the U.S. Department of Energy and NASA.

The optically pure D- and L-enantiomers of isovaline, which cannot be racemized by ordinary chemical mechanisms involving alpha-hydrogen removal and which has been isolated in apparently racemic form from the Murchison meteorite, have been subjected to partial radiolysis by the ionizing radiation from a 3000-Ci Co-60 gamma-ray source. Both in the anhydrous and hydrated solid states and as solid sodium or hydrochloride salts each enantiomer suffered significant radioracemization of the undestroyed residue during its partial radiolysis. The sodium salt of isovaline in 0.1-M aqueous solution suffered extensive radiolysis with relatively small radiation doses, but showed no detectable radioracemization. The significance of these observations with respect to the primordial enantiomeric composition of the isovaline (and other amino acids) indigenous to meteorites is discussed.

(Author)

**A80-13075 \*** Parabolic flight - Loss of sense of orientation. J. R. Lackner (Brandeis University, Waltham, Mass.) and A. Graybiel (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). *Science*, vol. 206, Nov. 30, 1979, p. 1105-1108. 9 refs. Contract No. NAS9-15147. NASA Order T-5904.

On the earth, or in level flight, a blindfolded subject being rotated at constant velocity about his recumbent long body axis experiences illusory orbital motion of his body in the opposite direction. By contrast, during comparable rotation in the free-fall phase of parabolic flight, no body motion is perceived and all sense of external orientation may be lost; when touch and pressure stimulation is applied to the body surface, a sense of orientation is reestablished immediately. The increased gravito-inertial force period of a parabola produces an exaggeration of the orbital motion experienced in level flight. These observations reveal an important influence of touch, pressure, and kinesthetic information on spatial orientation and provide a basis for understanding many of the postural illusions reported by astronauts in space flight.

(Author)

# STAR ENTRIES

N80-10574# Texas Univ. at Austin.

## SOUTH AMERICAN RIVER MORPHOLOGY AND HYDROLOGY

R. K. Holz, V. R. Baker, S. M. Sutton, Jr., and M. M. Penteado-Orellana (Fundacao Univ. de Brasilia) *In NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 545-594 refs*

Avail: NTIS HC A99/MF A01

A guide to the hydrologic properties of streams in the Amazon and Paraguay Basins is presented. Photographs are presented from the Apollo Soyuz Test Project of the Amazon Basin. Stream regimes, including analyses of meander wavelengths, flood plain development, and basin morphology are discussed. Basin size, drainage network density, flood plain width, vegetation types and density, climatic factors, and terrain variability are assessed. Adjustments of changes in river morphology caused by altered water and sediment discharges and by quaternary climatic changes are discussed. A.W.H.

N80-10745# National Aeronautics and Space Administration, Washington, D. C.

## THE EFFECT OF DYNAMIC FACTORS OF SPACE FLIGHT ON ANIMAL ORGANISMS

A. M. Genin, ed. Sep. 1979 243 p refs Transl. into ENGLISH from the book 'Vliyanie Dinamicheskikh Faktorov Kosmicheskogo Poleta na Organizm zhivotnyh'. Moscow, Nauka Press, 1979 p 1-73, 79-148, 165-183, 186-191, 192, 196-217, 219-223, 231, 248 Transl. by Kanner (Leo) Associates, Redwood City, Calif. (Contract NASW-3199)

(NASA-TM-75692) Avail: NTIS HC A11/MF A01 CSCL 06C

Physiological, biochemical and morphological studies made on the Cosmos-782 biosatellite are presented. Rats, which were exposed on the biosatellite for 19.5 days, were examined immediately after completion of the flight and also during the 25 day period of readaptation to earth's conditions. The effect of factors of space flight, primarily weightlessness, on the organism was investigated for all systems of the body. R.E.S.

N80-10746# Desmatics, Inc., State College, Pa.

## AN EXAMINATION OF STATISTICAL IMPACT ACCELERATION INJURY PREDICTION MODELS BASED ON TORQUE AND FORCE VARIABLES

Dennis E. Smith and John J. Peterson Jul. 1979 23 p refs (Contract N00014-79-C-0128) (AD-A071625: TR-112-1) Avail: NTIS HC A02/MF A01 CSCL 06/19

This technical report describes the construction of impact acceleration injury prediction models from a set of twenty-eight -G sub x accelerator runs involving Rhesus monkeys with securely restrained torso and unrestrained head. Peak torque and force variables measured during these runs were used to predict injury likelihood. The relative contribution of these variables was examined with respect to the original and a modified version of the data set. Two possible prediction models were used to construct two critical envelopes, i.e., those values of the variables for which the predicted probability of injury (or fatality) is less than or equal to some specified probability. The preferred model was identified and discussed. GRA

N80-10747# Oak Ridge National Lab., Tenn.

## TYPES OF AQUATIC MICROCOSSMS AND THEIR RESEARCH APPLICATIONS

J. M. Giddings 1978 34 p refs Presented at the Symp. on the Savannah River Ecology Laboratory, Augusta, Ga., 8 Nov. 1978

(Contract W-7405-eng-26) (CONF-781101-1: ESD-Publ-1254) Avail: NTIS HC A03/MF A01

Aquatic microcosm research has developed along two basic lines, the model ecosystem and the model food chain. Originally used mainly to test ecological hypotheses, microcosms are now finding applications in assessing the environmental effects of human activities, particularly chemical pollution. A critical problem today is selection of appropriate microcosm types for different research needs. Model ecosystems are used for studying community or ecosystem-level phenomena, such as diversity, stability, nutrient cycling, and energy flow, under controlled conditions. Model food chains, which are simpler, easier to analyze, but less realistic than model ecosystems, are applicable to studies of population dynamics, interspecific competition, predator-prey interactions, and trophic dynamics. In contaminant research, microcosms are more useful as predictive tools than as screening tools. DOE

N80-10748# Joint Publications Research Service, Arlington, Va.

## USSR REPORT: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 122

12 Oct. 1979 134 p

(JPRS-74365) Avail: NTIS HC A07/MF A01

Various topics in biomedical and behavioral sciences are considered. Pharmacology in aerospace medicine, psychometric test equipment for assessing the human functional state, and air filters for removal of aerosols and fumes from the air are among the topics covered.

N80-10749# Joint Publications Research Service, Arlington, Va.

## PROBLEMS OF PHARMACOLOGY IN SPACE MEDICINE

V. S. Shaskov and B. B. Yegorov *In its USSR Report: Biomedical and Behavioral Sci., No. 122 12 Oct. 1979 p 1-20 refs Transl. into ENGLISH from Farmakol. Toksikol. (USSR), no. 4, 1979 p 325-339*

Avail: NTIS HC A07/MF A01

The effective use of drugs during the various stages of space flight is considered. The formulation and preparation of the composition of drugs for onboard medicine kits is discussed in terms of the specific factors of space flight, i.e. weightlessness. The use of drugs to enhance resistance to the factors of space flight is also discussed. J.M.S.

N80-10750# Joint Publications Research Service, Arlington, Va.

## A PORTABLE STAND FOR ASSESSING THE DYNAMICS OF A WORKING INDIVIDUAL'S FUNCTIONAL STATE

A. B. Leonova and V. G. Romanyuta *In its USSR Report: Biomedical and Behavioral Sci., No. 122 12 Oct. 1979 p 41-48 refs Transl. into ENGLISH from Tekhnicheskaya estetika (USSR), no. 7, 1979 p 24-26*

Avail: NTIS HC A07/MF A01

A portable, experimental test standard based on the use of a microprocessor as a working memory is described. Experiments aimed at studying the dynamics of human functional state during learning activity were conducted in order to test the portable stand. Results are presented and discussed. J.M.S.

N80-10752# Joint Publications Research Service, Arlington, Va.

## USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 13, NO. 5, 1979

O. G. Gazenko, ed. 29 Oct. 1979 145 p Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 1-87

(JPRS-74470) Avail: NTIS HC A07/MF A01

The physiological and biological effects of various space flight factors are considered. Motion sickness in weightlessness, effects of hypoxia and hypokinesia on metabolism, toxicity of the atmosphere of pressurized chambers, and aspects of the closed ecological system are among the topics covered.

**N80-10753#** Joint Publications Research Service, Arlington, Va.

**CURRENT CONCEPTIONS ON THE GENESIS OF VESTIBULOVEGETATIVE DISORDERS IN WEIGHTLESSNESS**

B. I. Polyakov *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 1-12 refs Transl. into ENGLISH of Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 3-10*

Avail: NTIS HC A07/MF A01

The hypotheses of the genesis of vestibulo-vegetative disorders in weightlessness are analyzed. Preference is given to the concept which attaches greatest importance to the changes in stereotyped interactions of analyzers responsible for space perception. It is however, emphasized that neither hypothesis can account for all the phenomena seen in crewmembers in orbital flight. It is, therefore, indicated that mechanisms of vestibulo-vegetative disorders need further study. It is believed that the most promising line of research is to study the role of endogenous factors determining individual variations of motion sickness susceptibility. J.M.S.

**N80-10754#** Joint Publications Research Service, Arlington, Va.

**EFFECT OF HYPOXIA ON FLUID-ELECTROLYTE METABOLISM AND RENAL FUNCTION IN MAN AS RELATED TO DIFFERENT DEGREES OF MOTOR ACTIVITY**

A. I. Grigoryev, V. I. Korolkov, G. I. Kozyreyskaya, and M. A. Dotsenko *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 13-18 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 10-14*

Avail: NTIS HC A07/MF A01

It was demonstrated that a prolonged (24 days) bed rest at altitudes of 2200 m and 3200 m as well as at sea level was accompanied by an increased renal excretion of fluids and osmotically active substances, including electrolytes. Exercises done during bed rest induced a smaller increase of the renal excretion of sodium and potassium. However, as bed rest continued the differences between the groups of test subjects disappeared. The levels of hypoxia and exercises used in the study proved inefficient to prevent changes in the fluid-electrolyte metabolism occurring during bed rest. Author

**N80-10757#** Joint Publications Research Service, Arlington, Va.

**AGE-RELATED DISTINCTIONS OF CHANGES IN PSYCHOPHYSIOLOGICAL FUNCTIONS OF PILOTS IN THE CIVIL AVIATION UNDER THE INFLUENCE OF VIBRATION AND NOISE**

Yu. N. Kamenskiy and Ye. A. Sokolova *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 30-34 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 21-24*

Avail: NTIS HC A07/MF A01

The effect of vibration and noise of helicopters on the psychophysiological functions of their crewmembers was studied in relation to their age. The changes were mostly pronounced in pilots younger than 20-25 and older than 45 years. The peculiar changes in the psychophysiological functions can be associated with the age-related features of adaptation to vibration and noise effects and with the different level of professional training. Author

**N80-10758#** Joint Publications Research Service, Arlington, Va.

**DIETARY SUPPLEMENTS USED TO PREVENT SOME CHANGES IN THE HUMAN BODY IN THE PRESENCE OF NERVOUS AND EMOTIONAL STRESS**

V. P. Bychkov and M. V. Markaryan *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 35-39 refs Transl. into ENGLISH from Kosm. Biol. i*

*Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 25-28*

Avail: NTIS HC A07/MF A01

Stress situations similar to those encountered in space flight were simulated. These included: (1) ascent to an altitude of 8000 m in a pressure chamber; (2) anticipation of gravitational acceleration on a centrifuge; and (3) performance mental activity under the conditions of time deficiency in 'success' and 'failure' situations. Changes in protein, carbohydrate, and vitamin metabolism, heart rate, adrenal function, and peripheral blood were noted. Nutrient ingredients (vitamins, glucose, minerals, phosphatid concentrate) added to the diet before and during stressful exposures were shown to correct the parameters studied. J.M.S.

**N80-10759#** Joint Publications Research Service, Arlington, Va.

**ROENTGENOLOGICAL EXAMINATION OF THE HUMAN HEART AFTER 100-DAY HYPOKINESIA**

I. G. Krasnich *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 40-44 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 28-31*

Avail: NTIS HC A07/MF A01

Two groups of male test subjects (each of 3 persons) took part in a 100-day bed rest experiment. During the study, group 2 did exercise. X-ray examinations showed that bed rest induced changes in the roentgenoanatomical structure of the heart, a decrease of its size and a disorder of its contractile function. In group 2 these changes were far less expressed. The recovery took 3 to 6 months. Author

**N80-10760#** Joint Publications Research Service, Arlington, Va.

**EFFECT OF SPACE FLIGHT CONDITIONS ON DEOXYRIBONUCLEOPROTEIN AND NUCLEIC ACID CONTENT OF RAT TISSUES**

E. Misurova, R. A. Tigranyan, K. Kropaceva, and M. Praslicka *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 29 Oct. 1979 (JPRS-74470) p 45-49 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 32-35*

Avail: NTIS HC A07/MF A01

The spleen of rats flown for 19.5 days aboard the biosatellite Cosmos-782 showed a significant increase of polydeoxyribonucleotides and a decrease of DNP and DNA. The spleen of synchronous rats did not exhibit any differences. This suggests that the increase of polydeoxyribonucleotides in flight rats immediately post-recovery was a result of the so-called gravity stress. The liver and white blood cells did not display any significant changes in DNP or nucleic acids. The changes in the content of nucleic acids in the thymus and bone marrow were insignificant. Author

**N80-10761#** Joint Publications Research Service, Arlington, Va.

**REACTIONS OF RATS TO OVERHEATING FOLLOWING PROLONGED HYPOKINESIA**

P. V. Vasiliev, G. D. Glod, Ye. P. Melnikova, L. N. Nikolskiy, S. V. Petrukhin, S. I. Sytnik, and N. N. Uglava *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 50-57 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 35-41*

Avail: NTIS HC A07/MF A01

The influence of hypokinesia on the nature of development of hyperthermia and dynamics of functional state of the animal thermoregulatory system is described. It was shown that following acute thermal exposures, the survival rate and life-time of hypodynamic rats increased. The changes were more expressed after 15-day than after 30-day hypokinesia. By the 7th recovery day thermal stability of rats approached the initial level. M.M.M.

**N80-10762#** Joint Publications Research Service, Arlington, Va.

**EFFECT OF HYPOKINESIA ON HIGHER NERVOUS ACTIVITY OF ALBINO RATS**

M. A. Kuznetsova and Ye. S. Meyzerov *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 58-62 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 41-44*

Avail: NTIS HC A07/MF A01

The effect of a 22-day hypokinesia study on the labyrinthine behavior of white rats was investigated. The test animals showed certain behavioral changes which developed throughout 22 days. However, significant changes occurred only during the first 6-7 days. Later, the changes diminished but retained their trend. The behavioral changes can be associated with inhibition of the nervous processes of higher cerebral compartments responsible for the higher nervous activity. M.M.M.

**N80-10763# Joint Publications Research Service, Arlington, Va.**

**THE COMBINED EFFECT OF CARBON MONOXIDE AND HYPOKINESIA**

B. I. Abidin, V. V. Kustov, V. I. Belkin, and A. N. Kondratyev *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 63-68 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 44-48*

Avail: NTIS HC A07/MF A01

The 30-day experiment, in which white male rats were exposed to a combined effect of hypokinesia and carbon monoxide at a concentration of 0.05 + or - 0.002 mg/l, showed that carbon monoxide did not influence significantly hypokinesia-induced changes. It is concluded that maximally allowable concentrations of carbon monoxide need not be reduced for 30-day hypokinesia exposures. Author

**N80-10764# Joint Publications Research Service, Arlington, Va.**

**LEVELS AND PROPORTION OF RNA AND PROTEINS IN THE SYSTEM OF THE NEURON: VESTIBULAR NUCLEAR NEUROGLIA AND CEREBELLUM DURING HYPOKINESIA**

L. M. Mamalyga *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 69-75 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 49-53*

Avail: NTIS HC A07/MF A01

The changes in the cell structures of the vestibular Bechterew's and Deiter's nuclei and in the cerebellar cortex were studied in rats in the presence of reduced muscular activity. The RNA and protein content were used to assess the direction and severity of changes in the functional activity of these brain elements. It was concluded that the restriction of motor activity has a substantial effect on RNA and protein content of the neuroglia system. The nature of changes in these substances was related both to the force of the extreme factor and morphofunctional organization of the brain, and the biochemical structure as well. M.M.M.

**N80-10765# Joint Publications Research Service, Arlington, Va.**

**SOME HEMODYNAMIC PARAMETERS DURING RESPIRATION OF OXYGEN UNDER EXCESSIVE PRESSURE**

K. I. Murakhovskiy and L. I. Letkova *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 76-81 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 53-57*

Avail: NTIS HC A07/MF A01

The experimental findings on the pattern and value of circulation changes in ten test subjects exposed to oxygen breathing at positive pressure of 20 mm Hg are cited. The major parameters of central circulation were registered by the method of radioactive label (<sup>113</sup>I) dilution. During the exposure, the test subjects showed an average 27% decrease in the cardiac

output as compared with the control level. The test subjects who were pretrained to the exposure displayed a smaller reduction of cardiac output. The circulation changes found under the experimental conditions were mainly induced by peripheral changes rather than by the cardiac function. It is concluded that the reduction of cardiac output is associated with a decrease of the venous return to the heart caused by the diminished circulating blood volume and by the increased total peripheral resistance. M.M.M.

**N80-10766# Joint Publications Research Service, Arlington, Va.**

**BICHROMATE OXIDABILITY AS A CRITERION OF QUANTITATIVE LEVELS OF ORGANIC IMPURITIES IN RECLAIMED WATER**

V. A. Kryuchkov and N. S. Mareyeva *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 82-87 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 57-61*

Avail: NTIS HC A07/MF A01

Experiments were carried out to study permanganate and bichromate oxidation of chemicals that may contaminate reclaimed water, initial and intermediate products of reclamation. Permanganate oxidability can be used as a qualitative indicator of water contamination with readily oxidizable admixtures only. Bichromate oxidability can be employed as a quantitative indicator of the total content of organic admixtures, provided that oxidation is carried out in a certain way. For the water reclaimed from the atmospheric condensate the following correlation between bichromate oxidability and the concentration of admixtures has been established: 1 mg O<sub>2</sub> consumed corresponds approximately to 0.66 mg of organic admixtures in water. M.M.M.

**N80-10767# Joint Publications Research Service, Arlington, Va.**

**AMOUNT OF MICROORGANISMS DISCHARGED FROM THE UPPER RESPIRATORY TRACT AND INTEGUMENT OF PEOPLE CONFINED IN A SEALED CHAMBER**

S. N. Zaloguyev, A. N. Viktorov, K. V. Zarubina, and V. P. Gorshkov *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 88-92 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 61-65*

Avail: NTIS HC A07/MF A01

In an enclosure the rate of microorganisms discharged into the ambient atmosphere increased significantly. There was a correlation between the rate, on the one hand, and the environmental parameters and hygienic measures used, on the other. The data characterizing the rate with which microorganisms are discharged into an enclosed environment can be applied for the design of air purification systems. Author

**N80-10768# Joint Publications Research Service, Arlington, Va.**

**ULTRASTRUCTURAL CHANGES IN CANINE HEPATOCYTES DURING CONTINUOUS CHRONIC EXPOSURE TO LOW DOSES OF GAMMA RADIATION**

L. A. Bespalova, V. V. Shikhodrov, and V. S. Romanov *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 93-99 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 65-69*

Avail: NTIS HC A07/MF A01

Electron microscopy of the liver of dogs exposed to chronic 6-year gamma-irradiation from the Co60 source demonstrated early changes in the hepatocyte structure at a relatively low dosage of 63 rad for 3 years. A comparative study of the submicroscopic reaction of hepatocytes of 3 groups of test dogs showed equally pronounced changes in the endoplasmatic reticulum: vacuolar transformation balloon dystrophy. The heterogeneity of ultrastructural changes of different hepatocytes was probably associated with a simultaneous development of processes of injury, reparation and adaptation of intracellular structures during the long-term gamma-irradiation exposure.

Parallel development of these processes assured reparative biosynthesis to maintain the normal hepatic function. Author

**N80-10769#** Joint Publications Research Service, Arlington, Va.

**RUSH NUTS (CYPERUS ESCULENTUS) AS A SOURCE OF VEGETABLE OIL IN A CLOSED LIFE SUPPORT SYSTEM**

M. P. Shilenko, G. S. Kalacheva, G. M. Lisovskiy, and I. N. Trubachev *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470)* 29 Oct. 1979 p 100-105 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 70-74

Avail: NTIS HC A07/MF A01

The cultivation schemes, productivity, total biochemical, lipid in particular, composition of nodules of chufa (*Cyperus esculentus*) were studied, using a phytotron. Upon continuous illumination, chufa yielded a high total productivity and a satisfactory coefficient of economic effectiveness (not less than 50%). Chufa nodules have an optimal ratio of proteins, carbohydrates, and fats containing essential fatty acids. To meet man's requirements for vegetable oils and essential fatty acids, it is necessary to produce daily 150-200 g dry chufa nodules which are quite acceptable as a dietary ingredient. Author

**N80-10770#** Joint Publications Research Service, Arlington, Va.

**A METHOD OF DEFINING THE OPTIMUM LEVEL OF IONIZING RADIATION FROM DETERMINATE SOURCES DURING SPACE FLIGHTS**

A. V. Kolomenskiy and V. A. Sakovich *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470)* 29 Oct. 1979 p 106-110 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 74-76

Avail: NTIS HC A07/MF A01

A method of determining the permissible dose, D<sub>d</sub> (or dose rate) of such determinate radiations over the entire flight is described. The criterion of radiation safety in the form of maximum risk is obtained with a minimum weight of such protection. It is also possible to extend this method to a large number of sources, each with its own protection, unrelated to other sources. J.M.S.

**N80-10771#** Joint Publications Research Service, Arlington, Va.

**PSYCHOPROPHYLAXIS OF FATIGUE AND FUNCTIONAL CARDIOVASCULAR DISEASES IN PILOTS BY MEANS OF SELF-CONDITIONING**

A. N. Gurov *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470)* 29 Oct. 1979 p 111-113 ref Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 77-78

Avail: NTIS HC A07/MF A01

The great physical and emotional tension inherent in flight work, and the effects of various adverse flight factors (temperature changes, lowering of partial oxygen pressure, restriction of movements, gravitational influence, etc.) are considered in terms of development of early fatigue and functional cardiovascular diseases. Psychological, moral, and political pilot training to increase mental and physical resistance to various flight factors is shown to be effective in reducing flight fatigue and structural cardiovascular diseases. J.M.S.

**N80-10772#** Joint Publications Research Service, Arlington, Va.

**USE OF SHORT-ARM CENTRIFUGE TO PREVENT DECONDITONING WHEN IMMERSED IN WATER (ACCORDING TO H-REFLEX)**

B. I. Zborovskaya *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470)* 29 Oct. 1979 p 114-116 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 78-79

Avail: NTIS HC A07/MF A01

The possibility of using periodic rotation on a short-arm centrifuge (SAC) as a means of preventing the adverse effects of immersion was assessed. Healthy volunteer subjects were immersed in water for 3 days. The rate of build-up of accelerations constituted 0.2 units/s, time of exposure to accelerations of +3Gz constant in magnitude and direction constituted 5 min. Each subject was submitted to +3Gz after pure immersion and immersion combined with periodic rotation on a SAC, where accelerations of +0.8 Gz, +1.2 Gz or 1.6 Gz were generated for 60 min twice a day (first series) and for 40 min 3 times a day (second series). The subjects were positioned on the SAC in such a manner as to have the axis of rotation traverse the region of the bridge of the nose. Under these conditions, neuromuscular functions were tested by the methods of the H (Hoffmann) reflex and electromyography. Results are discussed.

J.M.S.

**N80-10773#** Joint Publications Research Service, Arlington, Va.

**COURSE OF ALTITUDE CAISSON DISEASE IN DOGS EXPOSED TO ACCELERATIONS**

V. I. Prodin and I. N. Chernyakov *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470)* 29 Oct. 1979 p 117-120 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 79-81

Avail: NTIS HC A07/MF A01

The combined or successive effects of low pressure and G forces were investigated. The dynamics of development of symptoms of altitude decompression sickness were traced against the background of changing hydrostatic pressure due to acceleration. Altitude decompression sickness was induced in mongrel dogs. Animals with marked symptoms were divided into two groups. The natural outcome of the sickness was observed in one group, while the other group was rotated on a centrifuge. Results are discussed.

J.M.S.

**N80-10774#** Joint Publications Research Service, Arlington, Va.

**INVESTIGATION OF ALVEOLOARTERIAL DIFFERENCE FOR OXYGEN AND CARBON DIOXIDE WHEN BREATHING HIGH-DENSITY GAS MIXTURES**

I. A. Bryantsev, A. G. Dianov, V. V. Isayenko, A. V. Suvorov, and R. I. Finogenova *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470)* 29 Oct. 1979 p 121-123 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 81-83

Avail: NTIS HC A07/MF A01

Respiratory reactions to breathing high density gas mixtures were investigated using nonanesthetized animals. Respiration rate, minute volume, and oxygen and carbon dioxide concentration in alveolar air were determined using a capnograph and a gas analyzer. It is concluded that inclusion of inert gas of high density in respiratory mixtures, at normal atmospheric pressure, does not elicit any appreciable changes in transport of oxygen and carbon dioxide.

J.M.S.

**N80-10775#** Joint Publications Research Service, Arlington, Va.

**TOXIC EFFECTS OF CHEMICALS IN THE ALTERED GAS ENVIRONMENT OF PRESSURIZED CHAMBERS**

G. I. Solomin *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470)* 29 Oct. 1979 p 124-126 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 83-84

Avail: NTIS HC A07/MF A01

The toxic effect of chemicals that are the products of gas emission from polymers on experimental animals in an altered gas environment were investigated in relation to spacecraft cabins. Studies were conducted with the use of 1,4-dioxane, ethyl acetate and isopropyl benzene. These agents are often identified in the air of manned compartments of spacecraft. Results are discussed.

J.M.S.

**N80-10776#** Joint Publications Research Service, Arlington, Va.

**EFFECT OF HYPOXIA ON ATPASE ACTIVITY OF THE BRAIN**

I. B. Buravkova, E. S. Mailyan, and Ye. A. Kovalenko *In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 127-131 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 85-87*

Avail: NTIS HC A07/MF A01

Experiments were conducted on rats and mice in order to study the effect of hypoxia on ATPase activity of the brain. It is shown that an increase in activity is the most typical reaction of Mg(2+)-ATPase to acute hypoxia. Factors affecting enzyme activity include dissociation of oxidation and phosphorylation and activation of phospholipase A. J.M.S.

**N80-10777** Rochester Univ., N. Y.

**USE OF THE PUPIL TO STUDY THE SCOTOPIC AND CHROMATIC MECHANISMS OF VISION IN HUMANS**

Ph.D. Thesis

Vasant Durgadas Saini 1979 361 p

Avail: Univ. Microfilms Order No. 7922962

Automated instrumentation was developed to conduct pupillometric experiments rapidly, accurately, and repeatably. Key features of the pupil light reflex were then studied, and its useful attributes were identified. A suitable procedure for measuring pupillary threshold was developed. It was verified that the pupil response to simple foveal flashes against a dark background was scotopic, but that other experiments indicated cone contribution to pupillary miosis. The unidirectional rate sensitivity of the pupil to retinal illumination was found to be a useful property of the pupil control system, and made it a convenient tool for studying the relationships between the scotopic and different chromatic channels of vision. This property was exploited, and a suitable model incorporating it was developed and used. Dissert. Abstr.

**N80-10779** California Univ., Los Angeles.

**THE EXTENDED KALMAN FILTER AS PULMONARY BLOOD FLOW ESTIMATOR** Ph.D. Thesis

Oleg Brovko 1979 276 p

Avail: Univ. Microfilms Order No. 7921375

The anesthetic uptake model was examined and developed to include dead space and shunt in the lung. The number of body compartments was examined and a representative model for anesthetic uptake was chosen which is computationally manageable for the on-line algorithm. Ljung's formulation of the extended Kalman filter was compared with the optimal nonlinear filter and modified to estimate time-varying lung perfusion. The results were then generalized to a large class of nonlinear filtering problems which are of theoretical and practical interest. The algorithm accuracy, ability to follow lung perfusion changes, stability and robustness were examined and the technique was shown to be as accurate as thermal dilution in the clinical environment. These experiments establish the potential value of the on-line algorithm as an estimator of pulmonary blood flow during both steady and nonsteady states. Dissert. Abstr.

**N80-10780** Wayne State Univ., Detroit, Mich.

**A MODEL FOR AUDITORY EVOKED POTENTIALS**

Ph.D. Thesis

Peter Michael Nefcy 1979 282 p

Avail: Univ. Microfilms Order No. 7921705

Volume-conducted potentials from brain stem auditory structures were recorded from the scalp. These auditory evoked potentials (AEP) are due to neuronal activity from subcortical structures located in the brain stem, as well as the primary cortical areas. A mathematical model utilizing moving and fixed dipoles in a homogeneous volume-conducting medium was developed to simulate the response of the auditory system to acoustic clicks of intensity 60 dBSL during the first fifteen msec after stimulus delivery. The model demonstrates

that the waves of the AEP can be generated from multiple sites in the brain stem. Various neurological disorders can be modeled with changes in the pathways, dipole magnitudes, and tract delays which reflect mechanisms of the disease processes.

Dissert. Abstr.

**N80-10781** Pennsylvania State Univ., University Park.

**PLASMA VOLUME CHANGES IN FIT MEN AND WOMEN DURING A HUMID HEAT STRESS BEFORE AND AFTER AN ACCLIMATION** Ph.D. Thesis

Janet Torma-Krajewski 1979 158 p

Avail: Univ. Microfilms Order No. 7922358

Plasma volume responses of fit men and women demonstrating similar maximum aerobic capacities were measured during a humid heat stress while walking on a treadmill at 30% maximal oxygen consumption. Prior to the acclimation no statistical differences in the core temperature, heart rate and blood pressure responses of the three groups were found. However, as judged by these responses, the observed trends indicated less strain in the pre-ovulation females when compared to the post-ovulation females and males. The females were better acclimated than the males as indicated by the rectal temperature responses. No statistical differences were observed in heart rate or blood pressure responses among the three groups.

Dissert. Abstr.

**N80-10782\*** Pennsylvania State Univ., University Park.

**KIDNEY CELL ELECTROPHORESIS Progress Report**

Paul Todd Jun. 1979 25 p refs

(Contract NAS9-15584)

(NASA-CR-160353) Avail: NTIS HC A02/MF A01 CSCL 06B

A kidney cell electrophoresis technique is described in four parts: (1) the development and testing of electrophoresis solutions; (2) optimization of freezing and thawing; (3) procedures for evaluation of separated kidney cells; and (4) electrophoretic mobility characteristics of kidney cells.

R.E.S.

**N80-10783#** Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

**THERMAL CONDUCTION EFFECTS IN HUMAN SKIN. PHASE 2: EXPERIMENTAL VALIDATION AND APPLICATION OF DATA IN SELECTION OF MATERIALS**

A. M. Stoll, M. A. Chianta, and J. R. Piergallini 15 Jan. 1979 17 p refs

(Contract CPSC-C-77-0091: WF51523000)

(AD-A068480) Avail: NTIS HC A02/MF A01 CSCL 06/14

Experimental production of threshold blisters at material temperatures, and contact times predicted from measurements of pain thresholds validated the concept underlying this study, that is, that the relationship between pain and blister thresholds established earlier for radiant and for convective heating could be extended into the region appropriate to conductive heating to provide a simple factor by which to convert pain threshold contact times to threshold blister times. From the successful demonstration of this thesis, it is concluded that extrapolation of converted pain threshold temperature-time values determined empirically constitutes a reliable means of predicting maximum permissible temperature of materials for safe contact with bare skin. The information so derived, pertinent to areas of minimal epidermal thickness, is presented to chart form suitable for use in preselection of thermally safe construction and manufacturing materials.

GRA

**N80-10784#** Wisconsin Univ. - Madison.

**PULMONARY ADAPTATION TO HIGH ALTITUDE Annual Report, 1 Feb. - 31 Dec. 1978**

Jerome A. Dempsey 22 Dec. 1978 20 p refs

(Contract DAMD17-77-C-7006: DA Proj. 3E1-61102-BS-08)

(AD-A068317) Avail: NTIS HC A02/MF A01 CSCL 06/19

This project is aimed at two closely related questions concerning man's adaptation to high altitude hypoxia: (1) What mechanisms regulate the ionic composition of brain intra- and extra-cellular fluid in long-term hypoxia; and (2) What role do these regulatory factors play in mediating ventilatory acclimatization to hypoxia; In the second year of our contract, we have accomplished the following: (a) found that CSF (H-) changed as

N80-10785

a function of ventilation during normoxia deacclimatization from chronic hypoxia; (b) established the rat as an animal model for human ventilatory acclimatization to chronic hypoxia, and observed the relative insensitivity of ventilation to alkaline brain perfusion in chronic hypoxia; (c) established the near-perfect regulation of brain pH in short-term hypoxia and/or hypocapnia and determined the contribution of changes in brain metabolism of this regulation; (d) established the necessary biochemical and physiologic methods and then showed a close link between CNS serotonin metabolism and the control of air-breathing eupnea in the awake rat; and (e) showed the difference in and importance of ventilatory adaptation in other physiologic states--sleep and exercise. GRA

**N80-10785#** Oak Ridge National Lab., Tenn.

**NATIONAL LIBRARY OF MEDICINE TOXICOLOGY DATA BASE MANAGEMENT SYSTEM**

J. S. Stanton and J. L. McNeany Apr. 1979 44 p  
(Contract W-7405-eng-26)

(ORNL/CSD/TM-80) Avail: NTIS HC A03/MF A01

A data management system developed for the National Library of Medicine toxicology data base (TDB) is described. The TDB data management system includes features to handle initial data entry, data editing, generation of proof listings, and conversion of data to and from the MARK IV file management system's input format. DOE

**N80-10786#** Medical Coll. of Wisconsin, Milwaukee. Div. of Environmental and Occupational Medicine.

**EFFECT OF A RAPID 4 PERCENT CARBOXYHEMOGLOBIN SATURATION INCREASE ON MAXIMAL TREADMILL EXERCISE**

R. D. Stewart, P. E. Newton, J. Kaufman, H. V. Forster, J. P. Klein, M. H. Keelen, Jr., D. J. Stewart, A. Wu, and C. L. Hake 1978 46 p refs  
(PB-296627/3; MCOW/ENVM/CO-78/2;  
CRC-APRAC-CAPM-22-75) Avail: NTIS HC A03/MF A01 CSCL 06T

The effect and adaptation to this hypoxic stress over four hours was measured in six physically fit fire fighters. The subjects were randomly exposed and exercised to exhaustion in a double blind experiment to either carbon monoxide (CO) or uncontaminated air twice a week for three weeks. On exposure days the subjects breathed 20,000 ppm CO for 45 seconds, followed by 30 ppm CO for four hours. The rapid increase in COHb resulted in a decrease (p less than .05) in the mean exhaustion times obtained immediately after the CO bolus (745.2 to 736.3 sec). However, this small exercise decrement was not consistently observed, and in 16 of the 44 measurements the trained subjects performed better following CO exposure. GRA

**N80-10787#** Ames Lab., Iowa.

**ANALYSIS OF AIRBORNE PARTICULATES AND HUMAN URINE BY INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY**

Kenneth W. Olson, William J. Haas, Jr., and Velmer A. Fassel Oct. 1978 123 p refs Sponsored by HEW  
(PB-297775/9; NIOSH-79/110) Avail: NTIS HC A06/MF A01 CSCL 06T

The results of sampling and multielement analysis of trace elements found in urine of workers and in workplace environments are presented. Inductively coupled plasma-atomic emission spectrometry (ICP-AES) was used to investigate both direct and indirect analysis schemes for air particulates. A unique facility was developed and used for the preparation of air particulate standard reference materials and is described. A complete sampling and ICP-AES analytical method for the simultaneous determination of trace elements typically present in urine samples was also developed and characterized. GRA

**N80-10788#** Civil Aeromedical Inst., Oklahoma City, Okla.

**THE DEVELOPMENT OF THE ATC SELECTION BATTERY: A NEW PROCEDURE TO MAKE MAXIMUM USE OF AVAILABLE INFORMATION WHEN CORRECTING CORRELATIONS FOR RESTRICTION IN RANGE DUE TO SELECTION**

James O. Boone and Mary A. Lewis Sep. 1978 46 p refs  
(AD-A066132; FAA-AM-78-36) Avail: NTIS HC A03/MF A01 CSCL 05/9

A five test selection battery is currently given to select the air traffic controllers. Data was collected on two new tests being considered for incorporation into the battery. To determine the utility of the old and new tests, it is necessary to correlate the tests with a criterion of job success. However, since criterion information is available only on persons already selected for air traffic control work, the correlation is restricted to this upper range of persons, and is, thereby, spuriously low for prediction purposes. To properly evaluate the utility of the tests, the correlation must be corrected for this restriction in range. A new procedure that was developed to more accurately correct correlations for restriction in range is described. The new procedure was compared with Gulliksen and Thorndike's procedures by the Monte Carlo method and was shown to be more accurate.

R.E.S.

**N80-10789#** Washington Univ., Seattle. Dept. of Psychology.

**LIFE STRESS, SELF-PREOCCUPATION, AND SOCIAL SUPPORTS**

Irwin G. Sarason 15 Apr. 1979 49 p refs Presented at meeting of the Western Psychological Assoc., San Diego, Calif., 6 Apr. 1979

(Contract N00014-75-C-0905; NR Proj. 170-804)  
(AD-A068624; SCS-LS-008) Avail: NTIS HC A03/MF A01 CSCL 05/10

A theoretical framework for stress research is presented which emphasizes the role of cognitions related to situational demands, constraints, and opportunities. The nature of these cognitions is influenced by personality characteristics, recent life experiences, and social supports. Relevant research dealing with these factors is reviewed. Two studies in which elements of social supports were experimentally manipulated are described. Their clinical and developmental implications are discussed. GRA

**N80-10790#** Human Factors Research, Inc., Goleta, Calif.

**RESEARCH ON THE PSYCHOPHYSIOLOGICAL BASIS OF HUMAN VIGILANCE Final Report, 1968 - 1978**

James F. O'Hanlon, Jr. Apr. 1979 17 p refs  
(Contract N00014-68-C-0296; NR Proj. 201-052)  
(AD-A068562; TR-787-F) Avail: NTIS HC A02/MF A01 CSCL 05/10

The research products of a program of studies directed at identifying the psychophysiological basis of human vigilance are briefly summarized. Much of the work focused on identifying the relationship between the biogenic catecholamines, adrenaline (A) and noradrenaline (NA), and human vigilance. A new fluorometric assay for subnanogram concentrations of (A) and (NA) was developed. Several studies were performed showing substantial correlations between vigilance performance and circulating concentrations of (A). It was shown that vigilance could be increased through pulsatile infusions of (A). Vigilance was shown to be adversely affected by typical urban concentrations of carbon monoxide (CO) and by hypoxia experienced at high altitudes. It was also shown that vigilance decrements occur not only with typical laboratory tasks (used early in the program) but also with realistic radar monitoring tasks. Target detection performance, using a typical radar PPI, was shown to deteriorate over time as excretion rates of (A) decreased. Concurrent monitoring of the EEG showed that the performance decrement was also accompanied by a decreased percentage of Beta and increased percentage of Alpha and Theta. GRA

**N80-10791#** Yale Univ., New Haven, Conn. Dept. of Psychology.

**AN ATTITUDE-STRATEGY INTERACTION IN LINEAR SYLLOGISTIC REASONING Research Report, 1 Jan. - 30 Mar. 1979**

Robert J. Sternberg and Evelyn M. Weil 1 Apr. 1979 51 p refs  
(Contract N00014-78-C-0025; NR Proj. 150-412)  
(AD-A068498; RR-1-79; TR-15) Avail: NTIS HC A04/MF A01 CSCL 05/10

The major goal of the present study was to demonstrate an aptitude-strategy interaction in linear syllogistic reasoning. Specifically, it was hypothesized that the efficiency of each of four alternative strategies for solving linear syllogisms--problems such as 'John is taller than Bill; Bill is taller than Pete' who is tallest?--would depend upon subjects' patterns of verbal and spatial abilities. This hypothesis was confirmed. The research also had three subsidiary goals. The first was to determine whether it is possible to train subjects to use various classes of strategies for solving linear syllogisms. It was found that such training is possible. The second goal was to determine whether certain strategies for solving linear syllogisms might be more efficient on the average than others. It was found that one strategy, used spontaneously by only a small minority of subjects but rather easily trainable, is more efficient than alternative strategies that subjects seem to use. The third goal was to provide a series of converging operations for testing the validity of one particular account of linear-syllogistic reasoning--a spatial-linguistic mixture model--for subjects receiving no explicit instruction in the solution of linear syllogisms. The validity of this model for the untrained subjects was upheld. It was concluded that componential analysis, a series of conceptual and methodological techniques for investigating intelligent performance, can provide a useful means for studying interactions between aptitudes and experimental treatments.

GRA

**N80-10792#** California Univ., San Diego, La Jolla. Center for Human Information Processing.

**A STUDY OF COMPLEX LEARNING THEORY AND METHODOLOGIES**

Ross A. Bott Mar. 1979 88 p  
(Contract N00014-76-C-0628; ARPA Order 2284; NR Proj. 154-387)  
(AD-A068323; REPT-7901) Avail: NTIS HC A05/MF A01 CSCL 05/10

This paper presents an analysis and model of the cognitive processes underlying complex learning situations. A theory is proposed that attempts to specify particular internal knowledge structures generated and modified during instruction, and to use them to explain specific difficulties that the learner experiences and also the overall progress being made. The theory states that (1) the underlying process reflects largely the prior knowledge structures of the student interacting with the information implied by the instruction; (2) the learning mechanisms involved are mostly simple and automatic; (3) the key information within the knowledge structures which allows complex learning to occur is the similarity between higher-order structures. This theory was applied to novices learning to use a computer text editor by reading a basic instruction manual and completing some exercises. After each sentence of instruction, they were asked to describe their current understanding, any difficulties they were aware of, and their expectations about what would follow. Their protocols were analyzed for evidence of underlying cognitive processes. These learning processes and the associated knowledge structures on which they operate were then modeled in terms of the theory at several levels of detail. Several issues of knowledge representation related to the model are discussed and possible solutions proposed.

GRA

**N80-10793#** Naval Ocean Systems Center, San Diego, Calif. **REMOTE OPERATOR PERFORMANCE COMPARING MONO AND STEREO TV DISPLAYS: THE EFFECTS OF VISIBILITY, LEARNING AND TASK FACTORS** Final Report

D. C. Smith, R. E. Cole, J. O. Merritt, and R. L. Pepper Feb. 1979 46 p refs  
(RR04207)  
(AD-A068201; NOSC/TR-380) Avail: NTIS HC A03/MF A01 CSCL 05/10

An analysis of visual perception related to the underwater environment is presented, followed by a discussion of 3-dimensional space perception, and the absolute and relative cues employed by the operator during task performance. Using a category 1 task, experiment 1 employed highly practiced subjects to reduce the effects of learning. Mono and stereo TV performance was measured under three levels of visibility degradation (simulated by contrast reduction). As predicted, stereo was superior

to mono under all conditions tested. Performance using both mono and stereo displays were both affected by degraded visibility. Experiment 2 was conducted with naive subjects using an experimental design which enabled an assessment of the degree of learning under operator testing conditions. We hypothesized that the category 1 task would show significantly less advantage for stereo, but that the effects of degraded visibility would continue to occur. The results are consistent with our interpretation. In experiment 3, the more visually complex category 2 task was employed. The design of the experiment was similar to experiment 2 so that evidence for learning could be assessed under these different conditions. Predictions concerning the degree of performance advantage for stereo vs mono displays were supported. This advantage was observed to increase with decreasing visibility, a finding which is consistent with our earlier predictions.

GRA

**N80-10794#** City Univ. of New York, N. Y. Dept. of Psychology.

**EVOKED CORTICAL POTENTIALS AND INFORMATION PROCESSING** Annual Report, 1 Jan. 1978 - 30 Jun. 1979

John L. Andreassi, Joseph A. Gallicchio, and Nancy E. Young  
30 Jun. 1979 104 p refs  
(Contract N00014-77-C-0114)  
(AD-A070789; AR-16) Avail: NTIS HC A05/MF A01 CSCL 05/2

In summary, the present findings show that there are perceptual differences between continuous and apparent motion and that these differences may be reflected in the latency and amplitude of the VEP. Furthermore, theoretical and cell system models were presented to account for the observed differences. These models propose that continuous motion is processed by specialized motion detecting cells which may respond to velocity as an intensity factor in motion. In apparent motion, the models suggest that cells would respond to the spatial and temporal change in position over time aspects of this type of motion and the role of velocity as an intensity factor would be diminished. Thus, it is suggested that future studies be undertaken to compare continuous and apparent motion using a wider range of velocity conditions and recording locations. Also, the direction of motion should be systematically examined for both continuous and apparent motion.

GRA

**N80-10795#** Oklahoma Univ., Norman. Decision Processes Lab.

**A MEMORY RETRIEVAL AID FOR HYPOTHESIS GENERATION** Progress Report, Aug. 1978 - Aug. 1979

Charles Gettys, Tom Mehle, Suzanne Baca, Stanley Fisher, and Carol Manning 27 Jul. 1979 37 p refs  
(Contract N00014-77-C-0615; NR PROJ. 197-040)  
(AD-A072657; TR-27-7-79) Avail: NTIS HC A03/MF A01 CSCL 05/10

This study investigates an aid for the hypothesis retrieval process which is based on a model for hypothesis retrieval developed by Gettys, Fisher, and Mehle (1978). A computer simulates the human hypothesis retrieval process by searching an enriched associative memory which contains the associations of a number of individuals in the form of a list of hypotheses for each datum. When the data of a decision problem become known, the appropriate lists are searched by the computer. Hypotheses that are common to most or all of the lists are suggested to the user, who assesses them for plausibility. An experiment was performed to determine the utility of the aid for both expert and non-expert users. The aid produced a substantial gain in performance for both groups of users, suggesting that further development of the aid would be worthwhile in decision situations which are repeated often enough to warrant the creation of an enhanced artificial memory. Also discussed are several techniques for implementing the aid, and determining the maximum gain in performance that the aid can produce.

GRA

**N80-10796#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

**MODALITY EFFECTS IN SCANNING NONVERBAL INFORMATION: EVIDENCE FOR MULTIPLE MEMORY CODES****Ph.D. Thesis**R. L. Hann Jun. 1979 74 p refs  
(AF PROJ. 7184)(AD-A072297; AMRL-TR-79-53)  
HC A04/MF A01 CSCL 05/2

Avail: NTIS

The purpose of this experiment was to study memory coding processes as a function of input sensory modality. Some investigators have proposed a single auditory/articulatory code, regardless of stimulus modality, while others have suggested that multiple sensory-specific codes are generated. Subjects in this study learned to associate 10 twelve-sided random polygons with ten complex sounds. These paired associates were then used in several versions of a Sternberg binary choice reaction time task. Results indicated that subjects were able to maintain sensory-specific memory information when it was advantageous to do so. The observed effects were best interpreted in terms of a multiple-code model, in which both a primary (same-modality) code and a weaker associate (opposite-modality) code are simultaneously generated as the to-be-remembered information is input.

GRA

**N80-10797# Sandia Labs., Albuquerque, N. Mex.  
SUMMARY OF PROJECT TO DEVELOP HANDBOOK OF HUMAN RELIABILITY ANALYSIS FOR NUCLEAR POWER PLANT OPERATIONS**A. D. Swain 12 Sep. 1978 25 p refs  
(Contract EY-76-C-04-0789)(SAND-78-1812C; Conf-781146-1)  
HC A02/MF A01

Avail: NTIS

A handbook to aid qualified persons to evaluate the effect of human error on the availability of engineered safety systems and features in nuclear power plants is described. The handbook includes a mathematical model, procedures, derived human failure data, and principles of human behavior and ergonomics.

DOE

**N80-10798# California Univ., Livermore. Lawrence Livermore Lab.****HUMAN VIGILANCE INVESTIGATION ANALYSIS OF THE PATTERN ARRAY TEST (FURTHER DATA ANALYSIS) Final Report**Andrew C. Have Apr. 1979 68 p refs Prepared in cooperation with Calif. Polytechnic State Univ., San Luis Obispo  
(Contract W-7405-eng-48)  
(UCRL-13891-3) Avail: NTIS HC A04/MF A01

A test which is designed to help solve problems of human vigilance encountered in a material safeguard system is presented. The efficiency of an operator is measured when large amounts of information are being processed from a video screen over extended periods of time. For the test, eight objects, either circles, squares, or triangles, are set in a 5 x 5 matrix which appeared on a video screen. The eight objects are shown for a specified length of time, blanked out for another specified period, and then eight objects are again shown in the same 5 x 5 matrix. The observer is tested on his ability to discern changes in patterns and/or symbols from frame to frame. It was found that changes in pattern were more easily identified than changes in symbols.

DOE

**N80-10799\* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.****PORTABLE BREATHING SYSTEM Patent**John S. Lovell, inventor (to NASA) (United Technologies Corp., East Hartford, Conn.) Issued 25 Sep. 1979 8 p Filed 24 Mar. 1977 Supersedes N77-21847 (15 - 12, p 1643) Sponsored by NASA  
(NASA-Case-MSC-16182-1; US-Patent-4,168,706;  
US-Patent-Appl-SN-780938; US-Patent-Class-128-142R;  
US-Patent-Class-128-191R; US-Patent-Class-128-212) Avail: US Patent and Trademark Office CSCL 06K

A semiclosed-loop rebreathing system is discussed for use in a hostile environment. A packed bed regenerative heat exchanger providing two distinct temperature humidity zones of breathing gas with one zone providing cool, relatively dry air and the second zone providing hot, moist air is described.

A.W.H.

**N80-10800\*# Life Systems, Inc., Cleveland, Ohio.****EXTENDED DURATION ORBITER STUDY: CO<sub>2</sub> REMOVAL AND WATER RECOVERY Final Report**

R. D. Marshall, G. S. Ellis, F. H. Schubert, and R. A. Wynveen May 1979 91 p refs

(Contract NAS9-15218)

(NASA-CR-160317; LSI-ER-319-24)

Avail: NTIS

HC A05/MF A01 CSCL 06K

Two electrochemical depolarized carbon dioxide concentrator subsystems were evaluated against baseline lithium hydroxide for (1) the baseline orbiter when expanded to accommodate a crew of seven (mission option one), (2) an extended duration orbiter with a power extension package to reduce fuel cell expendables (mission option two), and (3) an extended duration orbiter with a full capability power module to eliminate fuel cell expendables (mission option three). The electrochemical depolarized carbon dioxide concentrator was also compared to the solid amine regenerable carbon dioxide removal concept. Water recovery is not required for Mission Option One since sufficient water is generated by the fuel cells. The vapor compression distillation subsystem was evaluated for mission option two and three only. Weight savings attainable using the vapor compression distillation subsystem for water recovery versus on-board water storage were determined. Combined carbon dioxide removal and water recovery was evaluated to determine the effect on regenerable carbon dioxide removal subsystem selection.

R.E.S.

**N80-10801\*# Life Systems, Inc., Cleveland, Ohio.****PREPROTOTYPE VAPOR COMPRESSION DISTILLATION SUBSYSTEM Final Report**

George S. Ellis, R. A. Wynveen, and F. H. Schubert Aug. 1979 69 p

(Contract NAS9-15267)

(NASA-CR-160332; LSI-ER-312-4)

Avail: NTIS

HC A04/MF A01 CSCL 06K

A three-person capacity preprototype vapor compression distillation subsystem for recovering potable water from wastewater aboard spacecraft was designed, assembled, and tested. The major components of the subsystem are: (1) a distillation unit which includes a compressor, centrifuge, central shaft, and outer shell; (2) a purge pump; (3) a liquids pump; (4) a post-treat cartridge; (5) a recycle/filter tank; (6) an evaporator high liquid level sensor; and (7) the product water conductivity monitor. A computer based control monitor instrumentation carries out operating mode change sequences, monitors and displays subsystem parameters, maintains intramode controls, and stores and displays fault detection information. The mechanical hardware occupies 0.467 m<sup>3</sup>, requires 171 W of electrical power, and has a dry weight of 143 kg. The subsystem recovers potable water at a rate of 1.59 kg/hr, which is equivalent to a duty cycle of approximately 30% for a crew of three. The product water has no foul taste or odor. Continued development of the subsystem is recommended for reclaiming water for human consumption as well as for flash evaporator heat rejection, urinal flushing, washing, and other on-board water requirements.

**N80-10802# Logicon, Inc., San Diego, Calif.****DESIGN CONSIDERATIONS FOR THE MAN-MACHINE RELATIONS USER INTERFACE TO TAS Interim Technical Report, 15 Mar. - 15 Jul. 1979**

15 Jul. 1979 134 p

(Contract MDA903-79-C-0261; ARPA Order 3705)

(AD-A071207) Avail: NTIS HC A07/MF A01 CSCL 09/2

This effort consists of the analysis and design of a user interface which employs several man-machine relations factors; an existing system will be employed as a testbed for these beliefs - the COINS II Terminal Access System (TAS). This new interface must not interfere with the existing TAS user interface; it must coexist with the original and both must be accessible to TAS users. In addition to the software effort, intelligent terminals (i.e., microprocessor controlled) will emulate an electronic desk environment for the user. We feel that such modifications will result in greatly increased user acceptance of TAS, while providing a good indication of how such considerations can be applied to other systems and the possible effects of such efforts.

GRA

**N80-10803#** Anthropology Research Project, Yellow Springs, Ohio.

**REVISED HEIGHT/WEIGHT SIZING PROGRAMS FOR MEN'S PROTECTIVE FLIGHT GARMENTS**

Milton Alexander, John T. McConville, and Ilse Tebbetts Wright-Patterson AFB, Ohio AMRL Apr. 1979 117 p refs (Contract F33615-78-C-0508: AF Proj. 7184)

(AD-A070732; AMRL-TR-79-28) Avail: NTIS

HC A06/MF A01 CSCL 06/14

Presented in this report is an updated series of height/weight sizing programs for use by designers of protective clothing for USAF men. The sizing values are based on an analysis of data obtained in the 1967 survey of flying personnel and cover some 71 dimensions (excluding head, hand and foot measurements.)

GRA

**N80-10804#** Rockwell International Corp., Columbus, Ohio. Autonetics Missile Systems Div.

**VISUAL SEARCH PERFORMANCE IN SIMULATED REMOTELY PILOTED VEHICLE UTILIZATION AS A FUNCTION OF AUXILIARY TASK LOADING ON THE OBSERVER Final Report, 25 Aug. 1975 - 3 May 1976**

Richard B. Huntoon, Benjamin Schohan, and Uldi Shvern Apr. 1979 65 p refs

(Contract DAHC19-76-C-0011)

(AD-A072402; ARI-TR-357) Avail: NTIS HC A04/MF A01 CSCL 05/5

Baseline data were obtained on how well observers could extract information from a TV monitor while performing auxiliary tasks under task loading conditions that might be encountered in use of a remotely piloted vehicle (RPV) as the sensor platform. A simulation facility was used. It contained a terrain model, a TV camera transport, hybrid computing equipment, and a television display and control console. Six pilots and six nonpilots participated in the three-phase effort. Phase A required participants to detect and recognize tank-sized targets in open and cluttered backgrounds from a simulated altitude of 2,000 feet and a simulated RPV velocity of 100 knots. Phase B required participants to monitor and correct deviations in the RPV course and altitude and to respond to two visual warning indicators. Increasing the auxiliary load level decreased the probabilities and ranges of target detection and recognition. Target acquisition task demands similarly increased auxiliary task response times. Cluttered background significantly degraded target acquisition task performance, particularly when the auxiliary task was performed concurrently.

GRA

**N80-10995#** Joint Publications Research Service, Arlington, Va.

**HEALTH PROGNOSIS IN FLIGHT DISCUSSED**

R. Bayevskiy *In its USSR Report: Biomedical and Behavioral Sci.* No. 112 23 Jul. 1979 p 10-12 Transl. into ENGLISH from Meditsinskaya Gazeta (Moscow), 30 May 1979 p 3

Avail: NTIS HC A06/MF A01

A system of preventive measures to insure the rapid readaptation of a cosmonaut to the earth is discussed along with a method for predicting the state of health on long space flights.

F.O.S.

**N80-10996#** Joint Publications Research Service, Arlington, Va.

**THE THIRD SYSTEM OF REGULATION OF ANIMAL AND HUMAN FUNCTIONS, THE ACTIVE POINT SYSTEM**

A. V. Zhirmunskiy (USSR Academy of Sciences, Vladivostok) and V. I. Kuzmin (USSR Academy of Sciences, Vladivostok) *In its USSR Report: Biomedical and Behavioral Sci.*, No. 112 23 Jul. 1979 p 13-30 refs Transl. into ENGLISH from Zh. Obshchey Biologii (Moscow), no. 2, 1979 p 176-188

Copyright. Avail: NTIS HC A06/MF A01

The identification of the mechanisms and structures for control of vital functions of organisms is discussed in terms of active points.

F.O.S.

**N80-10997#** Joint Publications Research Service, Arlington, Va.

**TWO IMPORTANT DIRECTIONS OF DEVELOPMENT OF SOVIET BIOMETRY**

V. M. Shmidt (Leningrad State Univ.) *In its USSR Report: Biomedical and Behavioral Sci.*, No. 112 23 Jul. 1979 p 31-46 refs Transl. into ENGLISH from Zh. Obshchey Biol. (Moscow), no. 2, 1979 p 219-228

Copyright. Avail: NTIS HC A06/MF A01

The history and application of Soviet biometry are discussed in terms of correlation pleads, and taxonomic analysis. F.O.S.

**N80-11000#** Joint Publications Research Service, Arlington, Va.

**EVALUATION OF HEAT FLOW COMPONENTS FROM HEATER TO SKIN IN AN ELECTRIC THERMAL SUIT**

I. M. Naumenko (Academy of Sciences Ukrainian SSR, Kiev) *In its USSR Report: Biomedical and Behavioral Sci.*, No. 112 23 Jul. 1979 p 76-80 refs Transl. into ENGLISH from Dopovidi Akad. Nauk Ukrayinskoji RSR (Kiev), no. 4, 1979 p 294-297

Avail: NTIS HC A06/MF A01

The nature of heat transfer from the heater in an electric thermal suit to the human body is studied. An evaluation of the heat flow components of biological significance are presented. Information that prolonged exposure to low intensity radiant heat promotes an increase in the adenine nucleotides is discussed.

A.W.H.

**N80-11001#** Joint Publications Research Service, Arlington, Va.

**ULTRASTRUCTURE OF CHLORELLA PYRENOIDOSA CELLS (STRAIN g-11-1) FOLLOWING GROWTH UNDER CONDITIONS OF A PROLONGED SPACE FLIGHT**

K. M. Sytnyk (Academy of Sciences Ukrainian SSR, Kiev), Ye. L. Kordyum (Academy of Sciences Ukrainian SSR, Kiev), O. L. Mashynskyy (Academy of Sciences Ukrainian SSR, Kiev), A. F. Popova (Academy of Sciences Ukrainian SSR, Kiev), and H. M. Hrechko (Academy of Sciences Ukrainian SSR, Kiev) *In its USSR Report: Biomedical and Behavioral Sci.*, no. 112 23 Jul. 1979 p 98-104 refs Transl. into ENGLISH from Dopovidi Akad. Nauk Ukrayinskoji RSR (Kiev), no. 4, 1979 p 311-315

Avail: NTIS HC A06/MF A01

The effects of space flight on the growth and viability of the unicellular alga Chlorella pyrenoidosa, analysed by studying the ultrastructure of the cell, is examined. Difference between the control and experimental cells in the ultrastructure and volume relationships of cytoplasmic organelles and storage material are described. The accelerated accumulation of biomass and the accelerated ageing of the cells in space flight is discussed.

A.W.H.

**N80-11756\***# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

**INDIRECT MICROBIAL DETECTION Patent Application**

Judd R. Wilkins, inventor (to NASA) Filed 17 Aug. 1979 18 p (NASA-Case-LAR-12520-1; US-Patent-Appl-SN-067596) Avail: NTIS HC A02/MF A01 CSCL 06C

The 'invention' disclosed is an indirect microbial detection method. The growth of microorganisms in a sample is detected and monitored by culturing microorganisms in a growth medium and detecting a change in potential between two electrodes separated from the microbial growth by a barrier which is permeable to charged particles but microorganism impermeable. NASA

**N80-11757#** Army Research Inst. of Environmental Medicine, Natick, Mass.

**THE 5-THIO-D-GLUCOSE THERMOREGULATORY EFFECTS IN MICE AT VARIOUS TEMPERATURES**

Ralph P. Francesconi and Milton Mager 14 May 1979 24 p refs

(AD-A069511; USARIEM-M-12/79) Avail: NTIS  
HC A02/MF A01 CSCL 06/5

Adult, male mice were administered various doses of 5-thio-D-glucose (5-TG) at three environmental temperatures: 4 C, 22 C, and 35 C. Both intracerebroventricular (ICV) and intraperitoneal (IP) administration of 5-TG resulted in significant ( $p$  less than .05 to  $p$  less than .001) decreases in rectal temperature (Tre) which were usually dose-dependent. After 30 min the hypothermic effects were significantly ( $p$  less than .001, ICV, 100 microgram) exacerbated by cold exposure (4 C vs 22 C) and were likewise intensified significantly ( $p$  less than .005, 45 min, fed vs 18 h fasted) by food deprivation. These decrements in rectal temperature (Tre) were accompanied by significant ( $p$  less than .001) increases in circulating levels of glucose. The present results indicate that 5 TG may be eliciting both central and peripheral cellular glucopenia concomitant with circulatory hyperglycemia; thus, the resultant hypothermia may be arising from competitive inhibition of glycolysis by 5 TG intermediates as well as reduced availability of tissue glucose. GRA

N80-11758# Medical Biological Lab. RVO-TNO. Rijswijk (Netherlands).

**EARLY DIAGNOSIS OF DECOMPRESSION SICKNESS. CHANGES IN THE BLOOD FOUND SHORTLY AFTER DECOMPRESSION. EXPERIMENTS ON RATS**

M. Wijnans, P. M. Draeck, and P. vanEck Jul. 1978 29 p refs In DUTCH; ENGLISH summary (MBL-1978-7) Avail: NTIS HC A03/MF A01

In rats subjected to compression followed by decompression hemoconcentration was observed. The effects were then related to the severity of the applied compression-decompression procedure. In nearly all cases this hemoconcentration became apparent before signs of decompression-sickness were observed. Hemoconcentration occurred even in rats without symptoms. In a relatively large number of rats a drop in platelet count was noticed soon after decompression; but usually only after the platelet count was corrected for the hemoconcentration. It was found that in rats a rise in hematocrit had the highest prognostic value for the occurrence of symptoms of decompression sickness. Recommendations are given for an investigation of the possible prognostic value of hemoconcentration in divers.

Author (ESA)

N80-11759# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Frankfurt am Main (West Germany). Inst. fuer Flugmedizin.

**DISCRETE MULTIVARIATE ANALYSIS ON RADIOPHYSICAL RESULTS FROM THE BIOSTACK 3 BACILLUS SUBTILIS EXPERIMENT**

R. Facius, H. Buecker, and M. Schaefer 1979 6 p refs Presented at 22d COSPAR Plenary Meeting, Bangalore, India, May-Jun. 1979

Avail: NTIS HC A02/MF A01

The dependency of spore survival on HZE particle linear energy transfer (LET) and on their distance from the particles' trajectory during Biostack 3 experiments is discussed. Multivariate methods are applied as far as the stochastic point of view is concerned, it is shown that the major features of the bivariate results cannot be reduced to the heterogeneous frequency distributions of the respectively remaining physical parameters of the HZE particles. These findings bear on considerations about mechanisms, by which biological damage might be induced by high LET heavy ions.

Author (ESA)

N80-11760 Medical Univ. of South Carolina, Charleston.  
**CARBON DIOXIDE CONTRIBUTIONS IN RESPIRATORY CONTROL Ph.D. Thesis**

Edwin Merrill Adams 1979 148 p  
Avail: Univ. Microfilms Order No. 79620656

The contribution of carbon dioxide to respiratory control made by the carotid bodies and vagus nerves is investigated. The relationship between the central respiratory neuron in the ventral respiratory group and airflow, the latency response to CO<sub>2</sub>, the contribution of the carotid body to the hypercapnic response are discussed.

Dissert. Abstr.

N80-11761# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).

**IDENTIFICATION OF CONTROLS IN NEURO-MUSCULOSKELETAL CONTROL SYSTEM MODELS**

H. Hatze Oct. 1978 25 p refs (CSIR-TWISK-52) Avail: NTIS HC A02/MF A01

The commonly adopted practice of identifying the myoactuator torques in neuro-musculoskeletal control systems as the system controls is discussed. It is demonstrated that it leads to biologically unrealistic results. A systems model describing the excitation and contraction dynamics of skeletal muscle is then presented. In this model the control parameters are the actual neural controls, motor unit recruitment and stimulation frequency, and the model correctly predicts experimentally observed muscular force outputs for a wide variety of neural control inputs. A general myocybernetic performance criterion, and certain special cases pertaining to specific contractile modes are also discussed.

R.E.S.

N80-11762# Civil Aeromedical Inst., Oklahoma City, Okla.

**INTERSTIMULUS INTERVAL AS IT AFFECTS TEMPORARY THRESHOLD SHIFT IN SERIAL PRESENTATIONS OF LOUD TONES**

Jerry V. Tobias Jun. 1979 10 p refs (AD-A072006; FAA-AM-79-16) Avail: NTIS HC A02/MF A01 CSCL 06/16

Temporary threshold shifts were measured repeatedly during a session in order to determine effects of interstimulus interval (ISI) on the shift. The fatiguing sound was a 3 minute, 110 dB SPL, 4,000 Hz tone. Immediately following the 3 minute stimulation, Bekesy-audiometric tracings were made for 3 minutes at 5,656 Hz. Then the subject sat quietly for the ISI that was used during that session. The effect of the subject's rest time or time off was compared at two points on the recovery curve: at 30 seconds and at 2 minutes following the cessation of the fatiguing sound. For susceptible subjects tested with short-duration ISIs, each successive threshold showed a greater shift than the earlier ones for at least four tests. As ISI was increased, improvement seemed not to follow the expected linear form. At some critical value that varies from subject to subject, successive tests no longer differ from each other; each one is similar to a first trial in which no previous exposure to the high-level tone has occurred. For most subjects run under these conditions, the critical ISI value is at least 30 minutes.

Author

N80-11763# Boeing Aerospace Co., Houston, Tex.

**STARPAHC SPACE-ORIENTED MEDICAL EVALUATION Final Report**

12 Oct. 1979 6 p refs (Contract NAS9-14513) (NAS9-CR-160360) Avail: NTIS HC A02/MF A01 CSCL 06E

Development of the STARPAHC telemedicine system is documented. Using STARPAHC assessment results and monitoring experience, on board and ground based flight medical system monitoring requirements and operational procedures were developed for use with the Space Transportation System during OFT and mature operation phases of the shuttle.

K.L.

N80-11764# Army Research Inst. of Environmental Medicine, Natick, Mass.

**HYPOTHERMIA INDUCED BY CHLORPROMAZINE OR L-TRYPTOPHAN EFFECTS ON TREADMILL PERFORMANCE IN THE HEAT**

Ralph P. Francesconi and Milton Mager 28 Mar. 1979 21 p refs

(DA Proj. 3E1-61102-BS-08) (AD-A069849; USARIEM-M-8/79) Avail: NTIS HC A02/MF A01 CSCL 06/19

To study the effects of preinduced hypothermia on the physiological and thermoregulatory responses to exercise in the heat, rats were intravenously administered 100 microgram of chlorpromazine (Cpz) or 200 mg/kg of L-tryptophan (L-tryp) under restraint in a cold (4 C) environment. When rectal temperatures (Tre) reached 32-33 C, the rats were removed to a hot environment (35 C) where they ran on a level treadmill (9.14 m/min) to

hyperthermic exhaustion ( $T_r$  - 42.5-43 C). Both Cpz and L-tryptophane was effective in increasing significantly ( $p$  less than .001) the time to hyperthermic exhaustion. However, the maximal rectal and skin temperatures ( $T_{sk}$ ) attained were unaffected by either treatment. While exercising on the treadmill increments (C/min) in  $T_{re}$  and  $T_{sk}$  were significantly ( $p$  less than .02, minimal) greater for the initially hypothermic animals when compared to normothermic controls. Cooling rates were unaffected by either treatment. We concluded from these studies that while preinduced hypothermia is extremely effective in prolonging the time to hyperthermic exhaustion, no additional beneficial thermoregulatory responses accrued as a result of this treatment. Author (GRA)

**N80-11765#** Army Research Inst. of Environmental Medicine, Natick, Mass.

**COLD AIR INHALATION, ESOPHAGEAL TEMPERATURE LUNG FUNCTION IN EXERCISING HUMANS Final Report**

J. J. Jaeger, E. Chandler Deal, Jr., D. E. Roberts, and E. R. McFadden, Jr. 14 Mar. 1979 24 p refs Prepared in cooperation with Peter Bent Brigham Hospital, Boston, Mass. and Harvard Medical School, Boston, Mass.  
(AD-A069510; USAIRIEM-M-7/79) Avail: NTIS HC A02/MF A01 CSCL 06/16

Eight normal individuals performed 10 min of bicycle exercise at 80% of their predicted maximum workload while breathing air at 22 C, saturated with water vapor and air at -40 C, dry. Rectal temperature and temperature at various locations along the length of the esophagus were measured during the exercise period. Pulmonary mechanics were measured before and 5 to 10 min after exercise. Temperature in the lower third of the esophagus was in close agreement with rectal temperature and was unaffected by level of respiratory heat exchange. Upper esophageal temperature decreased substantially during exercise, the magnitude of the decrease being dependent upon proximity to intrathoracic airways and the level of respiratory heat exchange. Subjects bronchilated in response to exercise breathing warm air but this response was abolished by exercise breathing -40 C air. We conclude that at sufficiently high levels of respiratory heat exchange, normal individuals exhibit mild bronchoconstriction qualitatively similar to the severe bronchospasm induced in asthmatics by modest increases in respiratory heat exchange.

GRA

**N80-11766#** Army Aeromedical Research Lab., Fort Rucker, Ala.

**A PORCINE BIOASSAY METHOD FOR ANALYSIS OF THERMALLY PROTECTIVE FABRICS: A CLINICAL GRADING SYSTEM Final Report**

Thomas L. Wachtel, Francis S. Knox, III, and G. R. McCahan, Jr. Jun. 1978 35 p refs  
(DA Proj. 3E7-62173-A-819)  
(AD-A069202; USAARL-78-8) Avail: NTIS HC A03/MF A01 CSCL 06/3

A clinical grading system of severity of cutaneous burn was developed in a porcine cutaneous burn bioassay model using a flame thermal source. From surface appearance, color, sensation, tactile response, tenacity of hair anchoring, and appearance on cut section, a progression of the severity of burn injury was developed and documented with serial still photographs, high-speed cinephotomicrography and clinical descriptions. Variations in this grading scheme were required for skin protected or partially protected with fabrics, blackened with stove polish, or deprived of its circulation.

GRA

**N80-11767#** Gesamthochschule, Siegen (West Germany). Dept. of Physics.

**CALCULATED LINEAR ENERGY TRANSFER SPECTRA OF HZE PARTICLES FOR THE FREE FLYER BIOSTACK EXPERIMENT ON THE LDEF-MISSION**

W. Heinrich 1979 14 p refs  
Avail: NTIS HC A02/MF A01

The LDEF-mission, scheduled for launch on the Space Shuttle in 1981, will fly for about nine months in a near earth orbit with an inclination angle of 28. During this flight the Free Flyer Biostack experiment will measure biological effects of individual heavy ions from cosmic radiation. The corresponding results of

a calculation of linear energy transfer (LET) spectra in free space and inside the experiment are presented. The calculation considers the geomagnetic shielding of the spacecraft against charged particles with low energies and the disintegration of the heavy ions inside the experiment by fragmentation. For this mission the LET spectra will differ significantly from those of previous experiments. Primary particles with high LET are scarce. Inside the experiment the LET spectra change with depth of matter due to the energy loss and fragmentation of the nuclei.

Author (ESA)

**N80-11768#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Frankfurt am Main (West Germany). Inst. fuer Flugmedizin.

**SUMMARY OF RADIobiological FINDINGS: FROM SPACEFLIGHT TO GROUND-BASED STUDIES Annual Report**

H. Buecker and R. Facius 1979 8 p refs Presented at 22d COSPAR Plenary Meeting, Bangalore, India, May/Jun. 1979  
Avail: NTIS HC A02/MF A01

Radiobiological studies relative to manned space flight are reviewed. The prediction of relevant physical parameters, radiation effects and space flight factors, late effects, and heavy effects are discussed. It is concluded that a reliable a priori assessment of the radiobiological risk from longer duration space missions remains as yet a difficult task. The fact that some symptoms of biological injury become manifest only long after exposure is pointed out.

Author (ESA)

**N80-11769#** National Technical Information Service, Springfield, Va.

**TELECOMMUNICATIONS IN MEDICINE. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jul. 1979**

Elizabeth A. Harrison Aug. 1979 150 p Supersedes NTIS/PS-77/0725; NTIS/PS-76/0641; NTIS/PS-75/580; NTIS/PS-78/0751  
(NTIS/PS-79/0786/8; NTIS/PS-78/0751; NTIS/PS-77/0725; NTIS/PS-76/0641; NTIS/PS-75/580) Avail: NTIS HC \$28.00/MF \$28.00 CSCL 06E

Research reports cover teleconsultation, communications for emergency medical services, medical communication networks and television systems, and telecommunications for medical information systems and rural health services. This updated bibliography contains 143 abstracts, 15 of which are new entries to the previous edition.

GRA

**N80-11770#** New Mexico Univ., Albuquerque. Technology Application Center.

**ALTITUDE ACCLIMATIZATION. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1974 - Jul. 1979**

Samuel C. Mauk Aug. 1979 31 p Sponsored in part by NTIS  
(NTIS/PS-79/0857/7) Avail: NTIS HC \$28.00/MF \$28.00 CSCL 06P

This bibliography the international literature and covers all aspects of altitude acclimatization. Topics include high altitude environments, hypoxia, heart function and hemodynamic responses, physical exercise, human tolerances and reactions, physiological responses, and oxygen consumption.

GRA

**N80-11771\*** Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.

**PERFORMANCE, PHYSIOLOGICAL, AND OCULOMETER EVALUATION OF VTOL LANDING DISPLAYS Final Report**

R. A. North, S. P. Stackhouse, and K. Graffunder NASA Sep. 1979 160 p refs  
(Contract NAS1-15081)  
(NASA-CR-3171; HONEYWELL-F0584-FR1-1) Avail: NTIS HC A08/MF A01 CSCL 05H

A methodological approach to measuring workload was investigated for evaluation of new concepts in VTOL aircraft displays. Physiological, visual response, and conventional flight performance measures were recorded for landing approaches performed in the NASA Visual Motion Simulator (VMS). Three

displays (two computer graphic and a conventional flight director), three crosswind amplitudes, and two motion base conditions (fixed vs. moving base) were tested in a factorial design. Multivariate discriminant functions were formed from flight performance and/or visual response variables. The flight performance variable discriminant showed maximum differentiation between crosswind conditions. The visual response measure discriminant maximized differences between fixed vs. motion base conditions and experimental displays. Physiological variables were used to attempt to predict the discriminant function values for each subject/condition trial. The weights of the physiological variables in these equations showed agreement with previous studies. High muscle tension, light but irregular breathing patterns, and higher heart rate with low amplitude all produced higher scores on this scale and thus represent higher workload levels.

Author

**N80-11772#** Oklahoma Univ., Norman. Coll. of Education.  
**COGNITIVE STYLES: A REVIEW OF THE LITERATURE**  
**Interim Report, Jan. 1977 - Jan. 1978**  
Tillman J. Ragan, Kathryn T. Back, Vance Stansell, Lynna J. Ausburn, Floyd B. Ausburn, Patricia A. Butler, and Keith Huckabee  
Brooks Air Force Base, Tx. Air Force Human Resources Lab., Brooks Air Force Base, Tx. May 1979 62 p refs  
(Contract F33615-77-C-0047; AF Proj. 2313)  
(AD-A069435; AFHRL-TR-78-90(l)) Avail: NTIS HC A04/MF A01 CSCL 05/9

A review of the literature to identify the various cognitive style constructs and the instruments used to measure them was completed. Each was evaluated with specific attention to possible relationships to Air Force technical training. Ten cognitive styles were selected for an in-depth summary of the state of the art, with special attention given to those that gave most promise for use. GRA

**N80-11773#** California Univ., Berkeley. Operations Research Center.  
**THE SCOPE, LIMITS, AND TRAINING IMPLICATIONS OF THREE MODELS OF AIRCRAFT PILOT EMERGENCY RESPONSE BEHAVIOR** Research Report  
Stuart. E. Dreyfus and Hubert L. Dreyfus Feb. 1979 39 p refs  
(Grant AF-AFOSR-3594-78; AF Proj. 2313)  
(AD-A071320; ORC-79-2) Avail: NTIS HC A03/MF A01 CSCL 05/9

Three models of skill acquisition are proposed: (1) Nonsituational, (2) Intermediate, and (3) Situational. It is argued that only the third can account for highly skilled performance. The type of emergency training program each suggests and the level of pilot performance that each can be expected to produce is then investigated. We conclude that only training based on the situational model could possibly produce highly skilled emergency response behavior. GRA

**N80-11774#** McDonnell-Douglas Astronautics Co., St. Louis, Mo.  
**ROTARY WING PROFICIENCY-BASED AVIATOR SELECTION SYSTEM (PASS)** Final Report, 15 Feb. 1977 - 1 Mar. 1978  
Ruth Ann Marco, Richard F. Bull, Ronald L. Vidmar, and Brian D. Shipley, Jr. Jan. 1979 244 p refs  
(Contract DAHC19-77-C-0015; DA Proj. 2Q2-63743-A-722)  
(AD-A069838; MDC-1839; ARI-TR-79-A2) Avail: NTIS HC A11/MF A01 CSCL 05/9

The Proficiency-Based Aviator Selection System (PASS) is the result of an operational feasibility program developed to determine whether a learning sample approach could be used to select candidates for rotary wing aviator training. PASS was based on the Automatic Pilot Aptitude Measurement System (APAMS), a five-hour learning sample of fixed wing piloting tasks, developed for the Air Force Pilot Selection Program. PASS utilizes a UH-1 Flight Simulator (UH-1 FS) with a five-degree-of-freedom motion base to present the syllabus and test materials. The APAMS syllabus was extensively modified to conform to rotary wing flight operations, and the UH-1 FS software was reconfigured and formatted to meet the PASS requirements for

training and performance measurement. Four voice synthesizers (VOTRAX) were interfaced to the UH-1 FS to provide vocal feedback. The operational capability of the PASS was demonstrated in a test with 11 experienced rotary wing pilots and 11 candidates for rotary wing training. The primary audience for this report will be operational personnel in training selection and simulation, particularly for rotary wing aircraft. GRA

**N80-11775#** Washington Univ., Seattle. Dept. of Psychology.

**INTELLIGENCE AS AN INFORMATION PROCESSING CONCEPT** Interim Report, 1 Apr. 1978 - 31 Mar. 1979  
Earl Hunt May 1979 91 p refs Presented at the Brit. Psychological Soc. Conf. Nottingham, Engl. Apr. 1979  
(Contract N00014-77-C-0225; NR Proj. 154-398; RR0420601)

(AD-A069953) Avail: NTIS HC A05/MF A01 CSCL 05/10

This paper examines the relationship between general cognitive competence and several aspects of information processing. Three sources of individual differences in information processing are proposed: structure, strategy, and general attentional resources. Structural factors set limits on the effectiveness of specific information processing steps. These factors appear to be important when we contrast the cognitive capacities of extreme groups, such as normal and mentally retarded persons but they account for only a small amount of the variability in homogeneous groups such as college students. The reason may be that within such groups, strategy of attacking problems is a more important source of variation, and moderates the relationship between simple information processing steps and complex reasoning. Finally, the fact that scores on almost all measures of cognitive competence are positively correlated may be related to the fact that all mental processes seem to compete for general attentional resources, and that individuals differ in the attentional resources they can bring to bear on any cognitive task.

Author (GRA)

**N80-11776#** Canyon Research Group, Inc., Westlake Village, Calif.

**DEVELOPMENT OF UNIT TRAINING AND EVALUATION TECHNIQUES FOR COMBAT-READY HELICOPTER PILOTS. TASK 2: ASSESSMENT OF ARTEP AND ATM TRAINING OBJECTIVES AND REQUIREMENTS FOR MAINTAINING OPERATIONAL READINESS** Research Note, 21 Sep. 1977 - 20 Sep. 1978

Colin D. Ciley, Jr. and George E. Long May 1979 25 p refs  
(Contract DAHC19-77-C-0059)  
(AD-A069224; FTR-01-78; ARI-RN-79-11) Avail: NTIS HC A02/MF A01 CSCL 05/9

The recently published Army Training and Evaluation Programs (ARTEP) and Aircrew Training Manuals (ATM) represent a new concept of Army aviation unit training. Commanders are now responsible for determining the training requirements of their individual units and for developing and implementing programs to meet those requirements. The ARTEP and ATMs were designed to assist the unit commanders in carrying out that responsibility. This report presents the results of a brief review of the utility of these documents in the field and the extent to which their content adequately represents the training objectives and requirements for maintaining combat readiness. The research concludes that the documents have been well received and are being utilized effectively by field commanders; that they contain a valid, though not entirely complete, reflection of combat-readiness training objectives and requirements; but, that the required recordkeeping is burdensome and there is a need for a more effective feedback system between its users and its developers. Author (GRA)

**N80-11777#** Canyon Research Group, Inc., Westlake Village, Calif.

**DEVELOPMENT OF UNIT TRAINING AND EVALUATION TECHNIQUES FOR COMBAT-READY HELICOPTER PILOTS. TASK 1: DEVELOPMENT OF AN INSTRUCTION PROGRAM FOR INDIVIDUAL AND UNIT TRAINING WITH COMBAT-READY PILOTS** Research Note, 21 Sep. 1977 - 20 Sep. 1978

George E. Long, Colin D. Ciley, Jr., Roik L. Jockenberger, and

Ethlyn A. Garlich May 1979 86 p refs  
 (Contract DAHC19-77-C-0059; DA Proj. 2Q2-63743-A-772)  
 (AD-A069242; FTR-05-78-1; ARI-RN-79-10-1) Avail: NTIS  
 HC A05/MF A01 CSCL 05/9

The attainment and maintenance of combat readiness must be a, if not the, primary responsibility of every field unit commander. To carry out that responsibility, commanders of units with combat missions need training and evaluation techniques that will train pilots who already know how to fly to accomplish the requirements of a specific mission in a battlefield environment as part of the combined arms team. In order to provide the required techniques and procedures noted above, it is first necessary to derive an effective and efficient approach to their development. That approach should result in the availability of techniques and procedures that will facilitate the attainment of the highest level of combat readiness in the largest number of operational units in the shortest amount of time. This report describes the research effort directed at the derivation of an approach to the development of training and evaluation techniques and procedures for combat-readiness training that will meet the above noted requirements. It also describes the effort directed at the partial development of two training modules consistent with that approach.

Author (GRA)

**N80-11779#** Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.

**LINEAR STATE FEEDBACK CONTROL OF RIGID-LINK MANIPULATORS**

David F. Golla May 1979 66 p refs  
 (UTIAS-TN-214; ISSN-0082-5263) Avail: NTIS  
 HC A04/MF A01

Linear state variable feedback controllers were designed for rigid-link manipulator arms. Two types of feedback schemes were considered, general rigid control (GRC) which allows for both interjoint and intrajoint feedback, and independent joint control (IJC) which allows for only intrajoint feedback. The design scheme consisted of arbitrary closed loop pole placement. Pole assignment algorithms were developed for both GRC and IJC feedback control schemes. Two controllers, IJC and GRC, were designed for a preliminary two-link rigid model of the space shuttle manipulator arm carrying a full payload in planar motion. The two models are simulated and the controllers compared. R.E.S.

**N80-11780#** Virginia Polytechnic Inst. and State Univ., Blacksburg.

**SPATIO-TEMPORAL INTERGRATION IN THE VISUAL SYSTEM** Final Technical Report, Aug. 1975 - Dec. 1977

Maier Algamor, Willard W. Farley, and Harry L. Snyder Feb. 1979 104 p refs  
 (Contract F33615-76-C-5022; AF Proj. 7184)  
 (AD-A069558; VPI-HFL-78-6; AMRL-TR-78-126) Avail: NTIS  
 HC A06/MF A01 CSCL 05/10

A new model for temporal and spatial encoding in the visual system is developed and presented. Three series of experiments were conducted to validate the model. The experiments used (1) a TV display of random, dynamic noise, and (2) a specially designed stimulus generator which produces very large homogeneous visual fields which can be easily modulated to reproduce a large variety of temporal waveforms having a rise time longer than 1 ms. The obtained results support the proposed model. The principal findings are: (1) Time integration of the eye is locally controlled at the retina and has very fast dynamics. (2) The obtained CFF curves suggest a correlation between the frequency at which maximum sensitivity is obtained and the sensitivity itself. (3) As predicted by the model, temporal bands are developed in the visual system for stimuli showing temporal discontinuity points. The width of the temporal bands was measured and a strong correlation was found between the temporal band width and the integration time. The width of the temporal bands is a function of the luminance level of the bands; the width is not dependent on the stimulus slope. The apparent brightness of the temporal band is, however, dependent on the slope of the stimulus.

GRA

**N80-11781#** Anthropology Research Project, Yellow Springs, Ohio.

**HEIGHT/WEIGHT SIZING PROGRAMS FOR WOMEN'S PROTECTIVE GARMENTS**

Ilse Tebbetts, John T. McConville, and Milton Alexander Jun. 1979 126 p refs  
 (Contract F33615-79-C-0511; AF Proj. 7184)  
 (AD-A072376; AMRL-TR-79-35) Avail: NTIS  
 HC A07/MF A01 CSCL 06/17

Presented in this report is a series of height/weight sizing programs for use by designers of protective clothing for USAF women. The sizing values are based on an analysis of data obtained in the 1968 survey of Air Force women and cover some 60 dimensions (excluding head, hand and foot measurements).

Author (GRA)

**N80-11782#** Honeywell Systems and Research Center, Minneapolis, Minn. Government and Aeronautical Products Div.

**INTEGRATED HELMET-MOUNTED SIGHT/DISPLAY PROGRAM: COATING TECHNOLOGY** Technical Report, 15 May 1973 - 15 Jun. 1973

J. M. Seeman and L. E. Homstad Jul. 1979 169 p refs  
 (Contract F33615-72-C-0420; AF Proj. 5973)  
 (AD-A072060; HONEYWELL-2079-SR3; AMRL-TR-79-61)  
 Avail: NTIS HC A08/MF A01 CSCL 05/8

Contents: Introduction; Summary of task results--Optics on plastics, Variable density, Durability and Abrasions, High absorption; Conclusions; Recommendations; Discussion; and References.

GRA

**N80-11783#** Honeywell Systems and Research Center, Minneapolis, Minn.

**HELMET-MOUNTED DISPLAYS: AN EXPERIMENTAL INVESTIGATION OF DISPLAY LUMINANCE AND CONTRAST**

B. J. Cohen, J. R. Bloomfield, and K. J. McAleese Jul. 1979 73 p refs  
 (Contract F33615-72-C-0420)  
 (AD-A072059; AMRL-TR-79-60) Avail: NTIS  
 HC A04/MF A01 CSCL 14/2

This study was carried out in order to validate experimentally the predictions of previous analytic work (Cohen, 1973). The objective was to determine the best combination of filter coatings and display luminances required for viewing the Helmet Mounted Display (HMD) against a wide, but operationally realistic variety of background luminances. The predictions relating beam splitter transmittance, visor transmittance and display luminance to performance were largely supported by the data.

GRA

**N80-11784#** Honeywell Systems and Research Center, Minneapolis, Minn.

**HELMET-MOUNTED DISPLAYS: A COMPUTER-ASSISTED ANALYSIS OF DAY-NIGHT VISUAL REQUIREMENTS**

B. J. Cohen Jul. 1979 296 p refs  
 (Contract F33615-72-C-0420; AF Proj. 5973)  
 (AD-A072061; HONEYWELL-2079-SR5; AMRL-TR-79-62)  
 Avail: NTIS HC A13/MF A01 CSCL 14/2

Honeywell has conducted a computer-assisted analysis in order to predict the range of ambient luminance conditions under which Helmet Mounted Display (HMD) imagery can be usefully resolved by an observer. This report examines those variables relating to ambient luminance, display luminance, and the attenuation of each in terms of optimizing display contrast minimizing differences in luminance to the two eyes. Visual performance predictions were made based upon comparing the analytically derived data with criteria values obtained from a limited number of technical reports. These criteria values were used even though it was recognized that the monocular see-through HMD is a unique system, thus limiting the applicability of data obtained from studies of related but still dissimilar systems such as head-up displays (HUDs) and occluded monocular HMDs. Among the factors affecting the quality of the displayed imagery, those variables most crucial to display luminance and contrast were systematically varied on a computer.

GRA

**N80-11785#** Honeywell Systems and Research Center, Minneapolis, Minn. Systems and Research Center.

**THE ROLE OF THE UPPER FIELD OF VIEW IN SELECTED  
HMS/D VISUAL TASKS**

B. J. Cohen and R. A. Levit 12 Jul. 1979 38 p refs  
(Contract F33615-72-C-0420; AF Proj. 5973)  
(AD-A072064; F4001-HSR1; AMRL-TR-79-65) Avail: NTIS  
HC A03/MF A01 CSCL 05/8

A study was conducted to determine whether opaque obstructions located in an observer's upper field of view would affect the visual detection of briefly illuminated targets located above his horizontal line of sight. Five versions of an acrylic visor considered for use with a helmet-mounted sight and display (HMS/D) contained one or more opaque areas located above their horizontal axes. Target detection performance for 12 subjects using the experimental visors was compared with the subjects' performance using an unobstructed control visor. Target appearance was signalled by a central cue light for six subjects (directed search), while the other six subjects were forced to rely only on peripheral detection of the briefly illuminated targets (undirected search). It was found that target detection performance was unaffected by either visor obstructions or by method of search, or any combination of the two. It was concluded that any of the visors would be usable from a visual performance standpoint.

GRA

**N80-11786# Honeywell Systems and Research Center,  
Minneapolis, Minn.**

**HELMET-MOUNTED SIGHT/DISPLAY PROGRAM: CESSNA  
310 FLIGHT TEST**

L. J. Mueller and B. A. Olson 12 Jul. 1979 84 p refs  
(Contract F33615-72-C-0420)  
(AD-A072058; F5517-HSR2; AMRL-TR-79-59) Avail: NTIS  
HC A05/MF A01 CSCL 05/8

The first phase of an engineering flight evaluation of operator performance with a Helmet-Mounted Sight/Display system has been completed. A total of 22 flights were conducted during which subjects utilized a helmet-mounted sight to control the pointing direction of a gimballed television camera and a helmet-mounted display to view the picture from the TV camera. Particular attention was paid to any indication of disorientation or discomfort attributable to the helmet-mounted equipment. No significant effect was noted. Secondary investigations considered the effect of servo dynamics in the TV camera system, angular motion limits in the pointing system, display field for view, display brightness, and environmental factors including target complexity and contrast, ambient brightness, and atmospheric haze. Interaction between the ambient scene viewed directly and through the combining glass of the helmet display caused no difficulty during the experiment. A second phase of this study considered the potential for inducing vertigo through the use of helmet-mounted equipment. The test plan and preliminary results for this experiment are presented in an appendix to this report. A detailed report on Phase II will be issued later.

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**N80-11787# Honeywell Systems and Research Center,  
Minneapolis, Minn.**

**OPERATIONAL PILOT FACTORS ANALYSIS REPORT**

B. A. Olson 12 Jul. 1979 123 p refs  
(Contract F33615-72-C-0420; AF Proj. 5973)  
(AD-A072063; HONEYWELL-2079-SR7; AMRL-TR-79-64)  
Avail: NTIS HC A06/MF A01 CSCL 14/2

This report describes the studies and analysis work done to identify performance requirements with respect to the operator who will wear the helmet and use the helmet sight/display system in the operational situation. Its purpose is to identify and document performance requirements for the IHMS/D equipment with respect to: Pilot population anthropometric and visual characteristics. Environmental effects of ambient light, field of view, acceleration, vibration, noise and space available. Display information requirements of accuracy, format, brightness, contrast, and the control response of the system.

Author (GRA)

**N80-11788# Army Aeromedical Research Lab., Fort Rucker,  
Ala.**

**HEAD AIMING/TRACKING ACCURACY IN A HELICOPTER  
ENVIRONMENT Final Report**

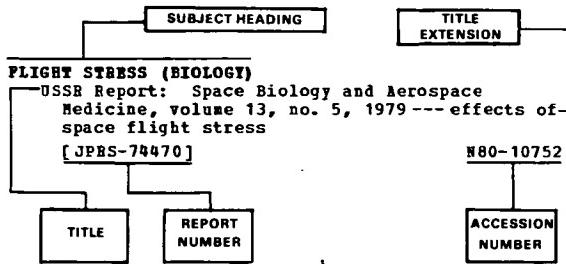
Robert W. Verona, John C. Johnson, and Heber D. Jones May 1979 86 p  
(AD-A071359; USAARL-79-9) Avail: NTIS HC A05/MF A01  
CSCL 05/8

This experiment was conducted to measure man's head aiming/tracking capability using a helmet mounted sighting device. The influences of target speed, helmet suspension types, and helmet weighting parameters on head aiming/tracking were investigated. If the aiming/tracking accuracy was sensitive to manipulation of these man-machine interface parameters, then it would seem to indicate that improved aiming/tracking accuracy could be obtained by improving the interface. The factors analyzed were eye dominance, helmet weighting, target speed, and helmet suspension. The eye dominance, helmet weighting, and target speed factors were statistically significant; however, the only factor of practical significance was target speed. A subject aiming at a static target with his head had an RMS error of about 3 milliradians. When the target began to move 4 degrees/second, the error increased to about 10.5 milliradians. When the subject began to vibrate, too, the error increased to 13 milliradians. When the target speed doubled, the vibrating error increased to 16.8 milliradians.

GRA

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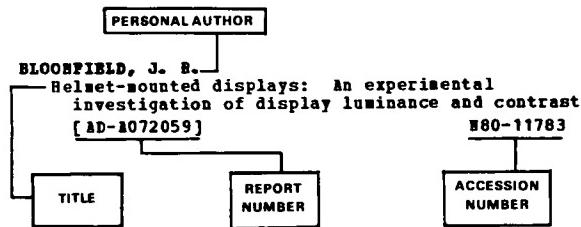
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